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Col. Pashley

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TACTICAL AND TECHNICAL TRENDS

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SECTION I

TACTICAL AND TECHNICAL TRENDS

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AIR (TECHNICAL)

1. THE NEW MITSUBISHI-NAGOYA ZERO FIGHTER

Early in July, a wrecked Japanese plane was found on Akutan Island. Examination revealed it to be a heavier, more powerful edition of the Mitsubishi Zero Fighter. Known as the Mitsubishi-Nagoya Zero, this plane has a longer and thinner tapered wing than its shorter and stubbier predecessor. Like the earlier Zero fighter, it is a low-wing monoplane with retractable landing gears and is powered by a twin-row 14-cylinder radial, air-cooled engine. Its normal range of about 500 miles can be increased by the use of detachable belly tanks to 850 or 1150 miles, depending on the size of the tanks. Its supposed maximum ceiling is 33,000 feet. Heavier and faster than the previous Zero Fighter, its reported maximum speed is 344 miles per hour.

There follows a detailed report of the Mitsubishi-Nagoya Zero:

Low-wing, all-metal, single-seat monoplane, single engine, pronounced dihedral, flush riveting used throughout, well streamlined, shows excellent construction. The plane is Zero type, No. 1, Carrier fighter plane, Model 2, put into service February 19, 1942.

Fuselage. About 23 feet long.

Wings. Pronounced dihedral, 40-foot wingspread, swept back on leading edge, tapered on trailing edge, about 24 inches of wing tips which fold up for stowage, split wing flaps, round wing tips; wings riveted solidly to fuselage. Wings 8 feet, 3 inches wide where they join fuselage. Place provided for bomb rack on each wing. When wing tips are horizontal, but not locked, a red tab projects to warn pilot. Much improvement is shown over our planes in the manner in which the lights on wings and tail are faired into the wing and tail.

Tail. Horizontal tail fin has slight negative dihedral, and is placed above center of the fuselage. It is tapered on both edges, but mostly on the leading edge; about 6 feet 8 inches long from fuselage to tip and 4 feet 9 inches wide next to the fuselage. The vertical fin is tapered about 45 degrees on leading edge.

Motor. Made by Nakajima, 14-cylinder, double-row, air-cooled radial. Motor is fastened with four bolts. Quick-change power plant assembly.

Propeller. 3-bladed, constant speed, spinner over propeller hub. Made by Sumitomo Metal Works Corporation, Propeller Manufacturing Plant.

Landing gear. Retractable, hydraulic system; when wheels are retracted, recess is covered with flaps; tire size, 600 x 175; tail wheel and arresting gear are retractable; tail wheel is solid rubber about 6 inches in diameter.

Armament. Two 20-mm. guns, one in each wing, about 60 rounds of ammunition for each; air-cooled; derived operating power by means of the Oerlikon method based on the "blow back" principle. The Japanese guns have a 30-inch barrel, pneumatic cocking device, pneumatic trigger motor, sturdy three-point suspension, a flash hider constructed as part of the barrel. Estimated muzzle velocity is 1,800 feet per second. Ammunition is stored in a sixty-round

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container. Ammunition was similar to our 20-mm. although the cartridge case was considerably shorter, and the type of fuse different. Several types of ammunition were known to be used. Although the guns examined were exposed to severe climatic conditions for almost five weeks, no signs of corrosion were evident. The guns gave every indication of precise workmanship and extremely careful maintenance.

Two 7.7-mm. recoil-operated guns, are synchronized to fire through the propeller; 500 rounds per gun; guns are type 97 made by Nippon Manufacturing Corporation; fixed machine gun, type 3, revision 2, 1942. Three sizes and shapes of 7.7 ammunition are loaded in the following manner: 1 tracer, 1 armor-piercing, 1 incendiary, 1 armor-piercing, 1 tracer. The tracer is semi-boat-tailed. Others have square bases, but are not the same size or shape. Cartridges are about 1/4 inch shorter than .3006, and wider at base. They are not rimless. The primer is much larger than normal, and is made with two firing points inside. The jacket is cupro-nickel. The cartridge will chamber in M 1, but will not fire because of rim and wide base. One bullet examined had flaw where jacket was incomplete.

Equipped with electric gun sight; No. 150; shows 16, month 12 (December, 1941). Manufactured Sendaïda Optical Works Corporation.

Gas Tanks. Detachable plywood belly tank, streamlined, about 18 inches in diameter, and 6 feet long. It is divided into compartments with splash boards, and sets nearly flush against the plane. It is fastened with one casting just aft of its landing gear. Apparently the belly tank holds only about one half of its rated capacity of 150 gallons.

There is a gas tank of welded and riveted aluminum in each wing, believed not to be leakproof.

Armor. No armor on any part of the plane.

Cockpit. Single seat, with pilot strapped to seat in three places; no armor; cockpit cover resembles plexiglass. Automatic flight control. Plate inside cockpit has following information: Place of manufacture--Mitsubishi Heavy Industries Co., Nagoya Airplane Manufacturing Plant. Name, Zero type Model, type A6M2 engine; Nakajima NK 1; weight, 1,715.0 kilograms (3,782 lbs.); carrying capacity, 650.3 kilograms (1,434 lbs.); entire weight, 2,365.3 kilograms (5,216 lbs.); the year, date, and month of completion, was February 19, 1942.

Radio. Two way radio; radio mast aft of cockpit is of streamlined wood, hollow with copper wire inside. 96 Type air, Number 1, wireless voice transmitter, type 1. Receiver No. 976, January 1942. Manufactured by Toyo Electric Corporation.

The radio compass was made by Fairchild Aero Camera Co., New York City. Aerial #429. Loop located in pilot enclosure just in back of pilot's seat. Controls located on right hand side of cockpit. L or R meter located on

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instrument dash board. This equipment looked as though it had been used before it was installed in this plane. Frequency range, 170 to 460 and 450 to 1200 KC. Switch was located in the 450 to 1200 KC position when gear was removed.

The radio receiver has 5 Japanese-made tubes of the following types: one 6C6 RF amplifier, one 6A7 1st detector and oscillator, one 6C6 IF amplifier, one 76 second detector, one 76 audio stage. Receiver is super-heterodyne with a crystal-controlled oscillator to determine the frequency of the receiver. It has a beat oscillator for CW reception. One dial to tune antenna and 1st detector stage. Frequency can only be changed by changing the crystal which plugs in the front of the panel. Both transmitter and receiver were using 4145 KC crystals. No other crystals were located in or about the plane. Radio was made by Toyo Electric Corporation in January 1942. Dynamotor is marked generator, air Model 1, revision 1, input 12.5 volts, 13 amps; output for sending 500 volts, 0.12 amps; output for receiving 150 volts, 0.03 amps. No. 302360; weight, 6.8 kilograms (15 lbs.) Made February 1942 by Koana Manufacturing Corporation.

The radio transmitter has power of about 10 watts, crystal controlled, voice of C.W. Frequency range approximately 2,000 KC to 6,000 KC. Frequency can only be changed by removing crystal and inserting another. Has a neon bulb for indicating resonance in the plate circuit and an antenna ammeter with maximum reading of .8 of an ampere. Power supply is in the 12 volt plane battery and a dynamotor supply of about 600 volts, D.C. Transmitter uses one Japanese 503 tube for oscillator and one Japanese 503 tube for modulator. These tubes seem to be the equivalent of an 807 RCA tube.

There were 3 dynamotors on the plane, one each for transmitter, receiver, and radio compass. They were located aft of the cockpit. The generator taken from the Fairchild Radio Compass was an Eclipse made in the United States.

Engine Oil Tank. Weight, 7.400 kilograms (16.3 lbs.); capacity, 60.0 liters (15.7 gals.).

Aileron. 130 inches long; 16 1/2 inches wide next to the fuselage, 8 inches wide at outside end. All control surfaces are of fabric.

Bomb Load. Place provided for a bomb rack on each wing.

Arresting Gear. Retractable; hook on arresting gear can be released by pilot.

Insignia. Insignia on top and bottom of wings; insignia on both sides of fuselage are much brighter than those on the wings; yellow stripe around after part of fuselage.

Parachute. Type 97 (1937) Parachute, Model 2; number of manufacture, 1490853; manufactured, September 9, 1939, at Fujikura Heavy Industries Corporation.

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Remarks. All parts are marked with name plates. The plane is light gray in color. All the inside metal surfaces are finished with blue coating. The electric gun sight was repaired with friction tape. This was the only part that showed wear.

2. FRENCH SE-200

French reports indicate increased production of aircraft for the French Naval Air Fleet.

Factories of the Societe Nationale des Constructions Aeronautique du Sud Est at Marignane, near Marseille, have begun a second series of 70-ton SE-200 flying boat. These heavy, six-engine boats are reported capable of transporting 40 passengers and 5,100 gallons of gas and oil, or 20 passengers and 7,500 gallons of gas and oil. Cruising speed is 186 miles per hour, with a range of 3,728 miles non-stop.

The plans for this flying boat were developed for the same design competition as the Potez-SCAN 161, six-engined flying boat that is now undergoing its tests.

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3. ORGANIZATION OF GERMAN ANTIAIRCRAFT UNITS

The basic tactical antiaircraft unit in the German antiaircraft artillery is the battalion. In accordance with standard German organizational practice, antiaircraft artillery defense forces are organized as task forces. Battalions of various categories of antiaircraft armament are assigned to a particular commander for the execution of a particular mission. The size and composition of an antiaircraft artillery task force depends on:

- a. The assigned mission (and its importance).
- b. The amount and characteristics of enemy aviation.
- c. The amount, types, and characteristics of friendly aviation available.
- d. The commander's estimate of the means required.
- e. The amount and types of antiaircraft artillery materiel available.
- f. The terrain.
- g. Proximity to the enemy.
- h. Weather and season of year.

There are believed to be several different types of regimental organization in the German antiaircraft artillery. Several that have been mentioned by usually reliable sources are heavy-gun regiments, medium-caliber regiments and searchlight regiments. These units are used in large defenses such as the ones about Berlin. Another regiment is the composite type made up of battalions of the various arms for the execution of missions smaller in scope.

Judging from observation of the way in which the German High Command conducts their campaigns, as soon as the German Air Force has control of the air, then a part of the antiaircraft artillery becomes available for other purposes, principally antitank. Its characteristics make it ideally suited for antitank defense. The use of antiaircraft artillery armament against British and French tanks on the Western Front in 1940 played an important part in frustrating the operations of Allied armored units against the German offensive.

During the campaigns in Poland and on the Western Front, the 37-mm. gun was the principal German antitank weapon. In Russia, the 50-mm. weapon is replacing the 37-mm. antitank gun and the 37-mm. gun in the Mark III tank, as rapidly as materiel becomes available. Even the 50-mm. gun is not sufficiently effective against the largest Russian tanks, therefore a more powerful weapon is needed. Large caliber antiaircraft guns are used for this purpose. When the air is relatively free of enemy aircraft, the 88-mm. guns form the backbone of the antitank defense. For this reason, the German practice of assigning an antiaircraft corps to a Panzer army serves a useful purpose in giving great defensive fire power to a strong offensive force.

From German reports, antiaircraft guns have also been used in assaults upon fortifications, to interdict important communications within effective range, and for direct support of infantry units. It must be remembered, however, that these secondary uses are only permissible when there is little or no threat from the air.

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Light and medium anti-aircraft automatic cannon (20-mm. and 37-mm.) have been used very effectively against Russian machine-gun nests, especially at dawn and dusk when there was sufficient visibility for daylight operations, and yet enough darkness to observe the muzzle flashes.

The primary mission of anti-aircraft searchlights is to illuminate hostile planes so they may be fired upon. Even if the planes cannot be illuminated, the searchlights make it difficult for the enemy air crews to orient themselves. Searchlights are also used to deceive hostile aviation personnel as to the exact location of important objectives.

The organization of the searchlight battalion is not definitely known. The presence of 27 lights in the 150-cm. battalion suggests three batteries, each composed of three platoons of three lights each. The 60-cm. searchlights are used with light and medium caliber weapons. It is believed that each light and medium anti-aircraft artillery battalion is normally equipped with 12 of these lights, organized into one battery, composed of four platoons of three lights each.

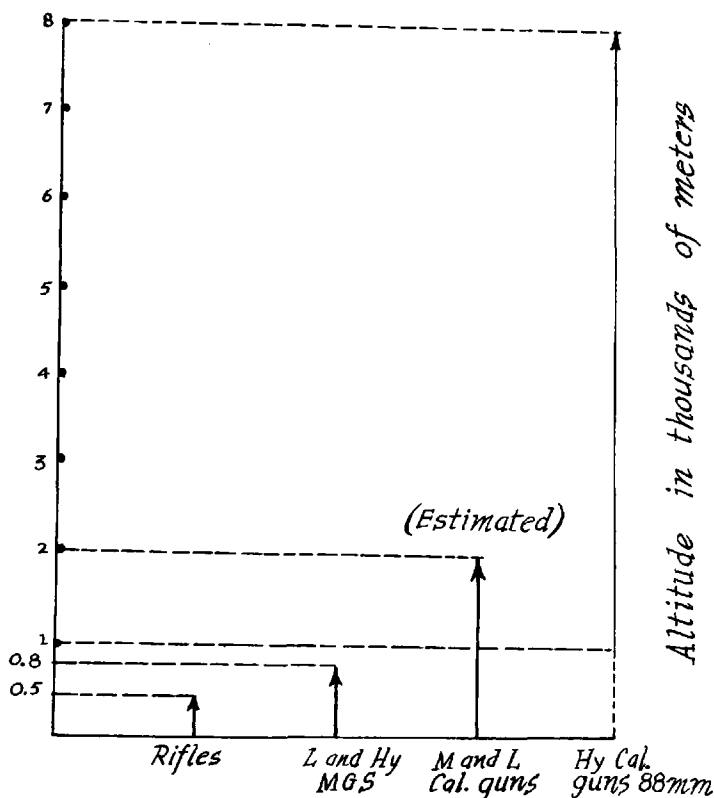
In the German armed forces, the light and heavy machine guns are identical, excepting that the light machine gun is used on a bipod mount (direct fire only), while the heavy machine gun is used on a tripod mount (direct and indirect fire). Naturally, there is no difference when the gun is used on anti-aircraft mount.

In the employment of anti-aircraft guns, it appears that special consideration is given to the defense of the artillery. This is true for defense against both air and armored attacks. As a result, heavy anti-aircraft gun batteries are sometimes emplaced forward of the artillery positions.

In obtaining information of enemy air operations, the Germans use the same system as we do. They have an aircraft warning service, a territorial warning service, as well as an anti-aircraft artillery information service manned and operated by the anti-aircraft forces themselves. The aircraft warning service is a separate unit manned by its own operating personnel. It extends all over Germany, and over the occupied areas wherever there is danger of enemy aerial attacks. It is of special interest to note that the Germans have mobile aircraft-warning service stations organized into companies which can be placed about vulnerable areas and objectives in accordance with the situation.

The sketch following is an analysis of the altitudes (or slant ranges) of responsibility for defense against enemy aerial attacks.

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4. GERMAN TROOP TRAIN PROTECTION AGAINST AIR ATTACK

The movement of troops by rail is always attended by dangers incident to sudden air attacks. The extent to which these can be successfully warded off, may often determine the final outcome of a battle.

The German Air Force Manual includes a section entitled "Protection of Troop Trains Against Air Attack."

Where trains are to be protected by means of antiaircraft machine guns, the troops transported will furnish 3 antiaircraft sections. Three antiaircraft railroad cars are provided, one at the center of the train, and one at the center of the front and rear halves of the train. There are two types of railroad cars: an open high-sided car with a superstructure or scaffolding, and an open low-sided car. The type of car used depends upon the make-up of the train. Thus in the case of non-motorized units which will use roofed cars for the most part, the guns must be placed at a considerable height in order to get a clear field of fire. Therefore, two high-sided cars with a superstructure are used, and only one low-sided car. This allotment of cars is reversed for motorized units. The high-sided antiaircraft cars are spotted in the train with the roofed cars, the low-sided antiaircraft cars with the open cars. Where possible, the guns are mounted on vehicles when the low-sided car is used.

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In conjunction with the antiaircraft machine guns, 20-mm. antiaircraft guns may be used. When the 20-mm. guns are to be used, 2 antiaircraft sections are formed, and 3 low-sided cars, specially designed for antiaircraft use, are provided. One car is placed at the tail-end of the train and another at the center. The third car is placed immediately behind the locomotive so that when the direction of the train is changed, as in switching for example, the tail car need not be shifted; if possible, this car should also be provided with a gun. At least 2 open cars with low loads should be coupled to either side of these special antiaircraft cars in order to give a good field of fire. Additional 20-mm. guns may be used when required.

Care must be taken that the guns are not struck by obstructions, such as passing trains, tunnels, signal posts, etc. For this purpose, lookouts are detailed to observe on each side of the train. When not firing, the 20-mm. guns should be pointed directly to the front or rear depending on their sector of fire.

No warning of attacks can be expected, so all antiaircraft personnel must be kept in a constant state of readiness. There are two aircraft watchers, one observing an arc of 180° to the front, the other to the rear. These watchers should be selected from among the best-trained men and relieved frequently.

The procedure for firing is as follows: The normal zone of fire of the guns near the front of the train is to the front, that of the guns near the rear, to the rear; these guns will support each other only when there are no planes within their respective normal zones. The guns in the middle of the train support the front or rear guns as the situation may require. When the train is moving, only tracer ammunition will be used since the motion does not permit accurate sighting. Care must be taken not to shoot up signal posts and other installations, and even if under attack no firing may be done where there are overhead powerlines. At prolonged halts, when for one reason or another fields of fire are obstructed, the guns should be dismantled and set up at suitable points in the surrounding countryside.

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ANTITANK (TACTICAL)

5. GERMAN BALANCED ANTITANK PROTECTION

The German 88-mm. dual-purpose AA and AT gun has been a vital factor in Rommel's African campaigns. However, this gun is only one element in the excellent antitank organization of the Germans and should be viewed in its proper perspective.

In accordance with German Army principles, each combat unit, from the smallest to the largest, is so organized, armed, and equipped as to be tactically self-sufficient. Antitank protection is vital to the successful accomplishment of a combat mission; therefore, suitable antitank weapons are provided for each unit. These weapons are used in accordance with the German doctrine of anti-tank defense, which may be summarized as follows:

Staffs, troops, and supply echelons must be prepared for a tank attack at all times. Careful ground and air reconnaissance and map study assist in indicating the avenues of approach feasible for hostile tank attacks. Certain terrain features are natural obstacles to tanks and must be used to full advantage. The favorable avenues of approach must be protected by antitank guns, artillery, mines, and tanks.

The antitank units, organically a part of infantry regiments, battalions, or companies contribute their fire power to the support and protection of their respective organizations. Those antitank units which are organically a part of corps and divisions, constitute a reserve force which, because of their mobility, can be rushed to decisive areas as determined by the general situation.

Early information relative to hostile tanks permits timely and coordinated defensive measures. All reconnaissance agencies must be required to report immediately tank information to the commander and to the troops specifically threatened.

Certain situations may require the attachment of additional units to anti-tank battalions such as signal, engineer, and infantry troops.

Antitank protection has been provided for in each of the units, from the smallest to the largest; furthermore, the amount of protection is being steadily increased.

Each infantry company is protected by a section of 3 AT rifles. In Africa, each company of a light division was reported to be equipped with two 76.2-mm. captured Russian field guns for antitank use. (However, see this publication, No. 3, p.5.). Each infantry battalion is protected by 9 AT rifles.

Each regiment is protected by 27 AT rifles and by an AT company which has 3 platoons, each armed with four 37-mm. AT guns (total 12), and one platoon of four 20-mm. rapid fire AA-AT guns.

A trend toward substitution of the 50-mm. AT gun for the 37-mm. AT gun is progressing rapidly.

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The infantry division is protected by 81 AT rifles, forty-eight 20-mm. AA-AT guns, and seventy-five 37-mm. or 50-mm. AT guns. The divisional AT battalion has 3 companies of twelve 37-mm. AT guns each and one company of twelve 20-mm. AA-AT guns. One AA battalion of twenty-four 20-mm. AA-AT guns and nine 37-mm. AA guns, or of thirty-six 20-mm. AA-AT guns may be attached.

The motorized division is protected by fifty-four AT rifles, twelve 20-mm. AA-AT guns, fifty-four 37-mm. AT guns, and nine 50-mm. AT guns. The motorized AT battalion has 3 companies of eight 37-mm. and three 50-mm. AT guns and one company of twelve 37-mm. AA-AT guns. An AA battalion of twenty-four 20-mm. AA-AT guns and nine 37-mm. AA guns may be attached.

The armored division is protected by high velocity guns mounted in the tanks (totaling one hundred seventeen 37-mm. or 50-mm. high velocity guns), by an AT battalion with twelve 37-mm. and eighteen 50-mm. AT guns, or an AT battalion with twenty-four 47-mm. self-propelled AT guns each mounted on a Mark I tank chassis with a three-sided armor shield, and by an AA Battalion with thirty-three 20-mm. guns.

A mobile AA battalion from the air force is often attached to a division when additional protection is required. This battalion contains 3 heavy batteries of 88-mm. AA guns, each battery consisting of four 88-mm. AA guns and two 20-mm. AA guns; 2 light batteries, each consisting of fifteen 20-mm. AA-AT guns and four 60-cm. searchlights; 1 searchlight battery consisting of nine 150-cm. searchlights and 6 sound locators.

Generally speaking, antitank weapons are of two types: either single-purpose, such as the 50-mm. AT gun, or dual-purpose, such as the highly effective 88-mm. AT and AA gun. The characteristics of the most commonly employed AT weapons may be summarized as follows:

I. SINGLE-PURPOSE ANTITANK WEAPONS

7.92-mm. AT Rifle (See sketch)

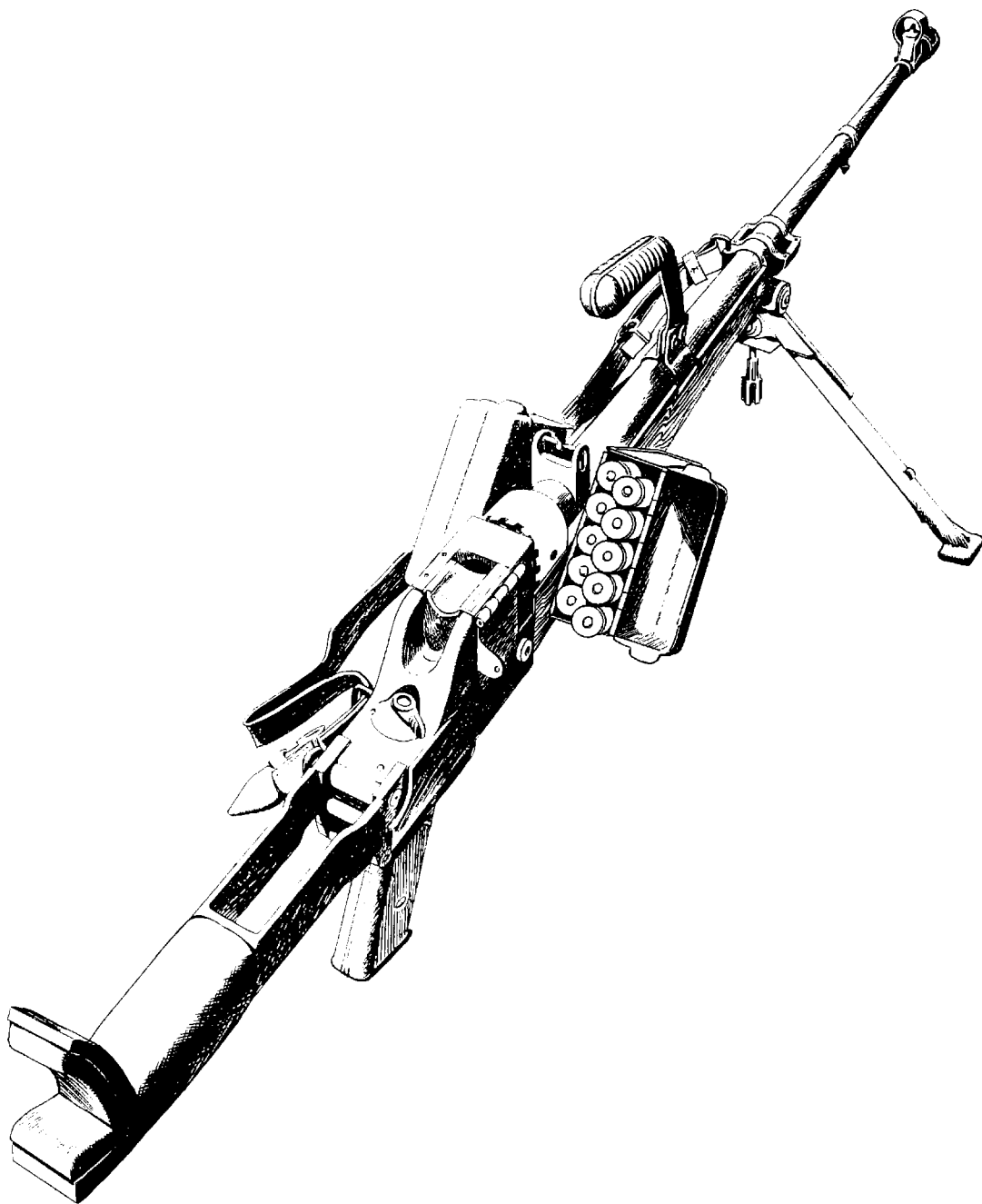
Specifications:

Weight	27 1/4 lbs.
Length (shoulder rest extended)	62 1/4 in.
Length (shoulder rest folded)	50 3/8 in.
Rate of Fire	6-8 r.p.m.
Muzzle velocity	3,540 f.s.
Penetration (Homo hard armor-plate at 100 yds., 90°)	33 mm. (1.3 in.)

Remarks: This AT rifle has a hand-lever-operated dropping block and is a single loader. Its ammunition is a special high-velocity armor-piercing type with a super-heavy charge contained in a 13.2-mm. case necked down to take a 7.92-mm. tungsten-carbide cored bullet.

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GERMAN 7.92-MM. ANTITANK RIFLE

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37-mm. AT Gun

Specifications:

Maximum range	4,400 yds.
Penetration (steel plate at 90°)	43 mm. (1.7 in.) at 330 yds. 33 mm. (1.3 in.) at 650 yds.
Rate of fire	12 r.p.m.
Traverse (trails closed)	4°
Traverse (trails open)	58°
Weight of AP shell	1.68 lbs.
Weight of HE shell	1.37 lbs.

Remarks: This is one of the main antitank weapons. The gun has two shields, fitted one above the other. The upper shield moves with the gun in traverse. There are four types of shell: armor-piercing with and without tracer, and high explosive with and without tracer. The gun is mounted on a well-sprung carriage and is fitted with low-pressure pneumatic tires for transportation as a motor trailer. It can be drawn by a detachment of soldiers across country for short distances.

47-mm. AT Gun

Specifications:

Weight (approximate)	1,980 lbs.
Length of barrel	7 ft. 2 in.
Muzzle velocity	3,000 f.s.
Weight of projectile	3.75 lbs.

Remarks: This gun made its appearance in the German Army in 1940. It is of Skoda manufacture. The mounting is a modified Mark I tank chassis.

50-mm. AT Gun (See sketch)

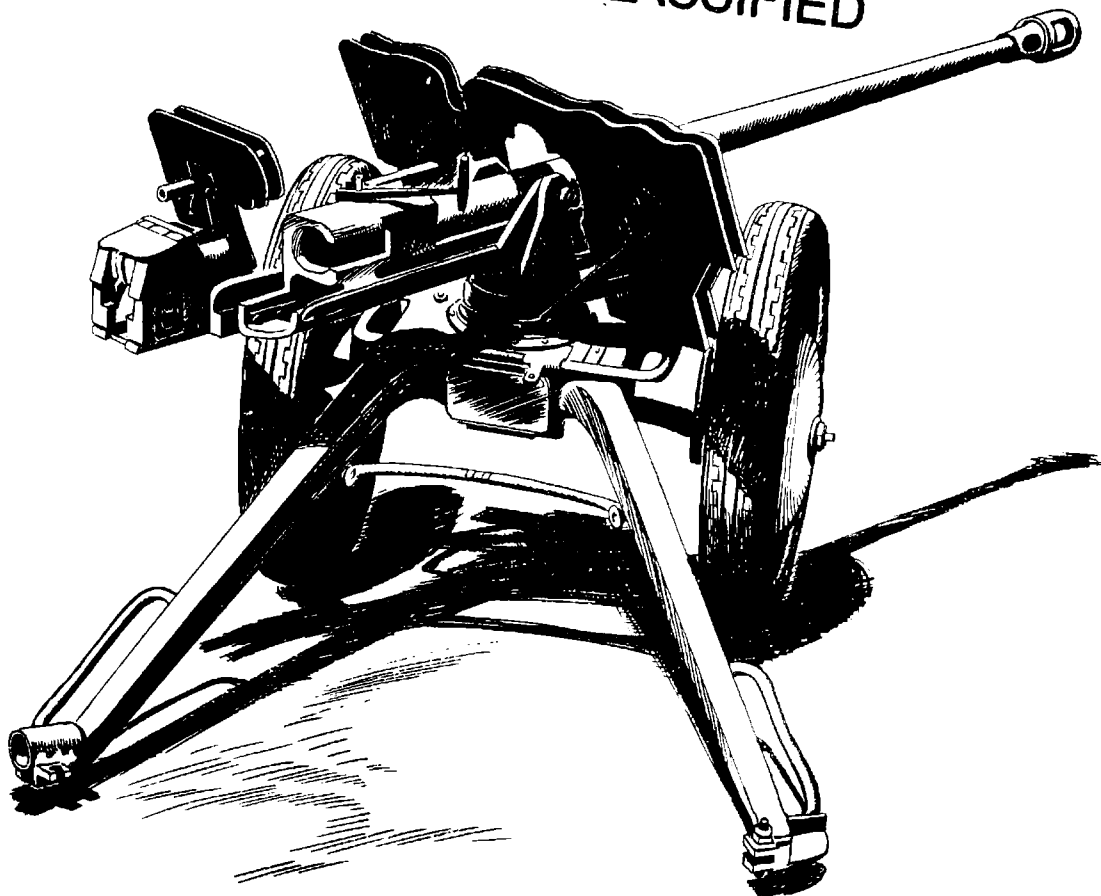
Specifications:

Weight	1,760 lbs.
Length of varrel	9 ft. 10.5 in.
Muzzle velocity	2,953-3,280 f.s.
Rate of fire	16 r.p.m.
Weight of AP shell	4 lbs. 9 oz.
Weight of HE shell	3 lbs. 15 oz.

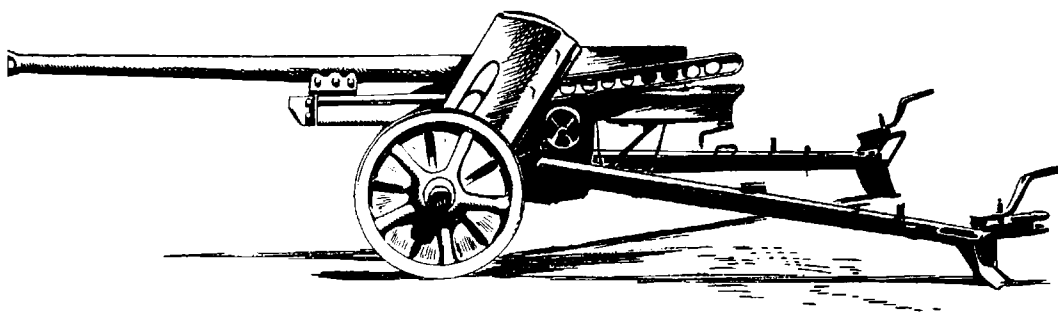
Remarks: This antitank gun was issued to the main units of the German Army in the spring of 1941. It is steadily replacing the 37-mm. as the standard antitank gun. The carriage is provided with an armor-plated shield and has a tubular split trail. The AP shell has pierced the armor of British infantry tanks and cruiser tanks and our light and medium tanks. There are also reports of a

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GERMAN ANTITANK GUN (M 41)



GERMAN 50-MM. ANTITANK GUN

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50-mm. AT gun on a self-propelled mount.

50-mm. Tank Gun (High Velocity)

Specifications:

Weight	421 1/2 lbs.
Length overall	210 cm. (12 ft. 11 in.)
Length of chamber	30.5 cm. (12 in.)
Length of rifling	162.2 cm. (5 ft. 4 in.)
Muzzle velocity	3,444 f.s.
Weight of AP shell	3.9 lbs.
Rifling	
Poly-groove plane section	
Uniform twist of 1 in 35 calibers	
16 lands, 3.5 mm. wide	
Grooves, 6 mm. wide, .75 mm. deep	

Remarks: This gun is mounted in the new Mark III German tank and has been very effective.

AT Gun (M 41) (See sketch)

Specifications:

Weight	501 lbs.
Muzzle velocity	4,700 f.s.
Caliber at breech	28 mm.
Caliber at muzzle	20 mm.

Remarks: The barrel of this semiautomatic gun is constructed on the Guerlich principle, i.e., it tapers from 28 mm. at the breech to 20 mm. at the muzzle as above indicated. The gun uses the so-called arrowhead type of ammunition. The life of the barrel is thought to be not over 400 rounds. The gun has a welded carriage with a split trail. It is served by a 5-man crew. It is manufactured by the Austrian firm of Bohler.

II. DUAL-PURPOSE WEAPONS

20-mm. AA-AT Gun

Specifications:

Weight in action	1,012 lbs.
Muzzle velocity	2,950 f.s.
Maximum horizontal range	6,124 yds.
Maximum vertical range	12,468 ft.

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Rate of fire - theoretical	280 r.p.m.
Rate of fire - practical	Unknown
Elevation	0° to +90°
Traverse	360°
Length of bore	65 cal. (4 ft. 3 in.)
Weight of shell	0.308 lbs.

Remarks: This gun may be towed by a light tractor or be self-propelled, mounted with a shield on a half-track vehicle. It fires self-destroying tracer ammunition. There is also a four-barreled type called the "Flakvierling." (See this publication No. 4, p.3.)

37-mm. AA Gun

Specifications:

Weight in action	3,400 lbs.
Muzzle velocity	2,800 f.s.
Maximum horizontal range	8,744 yds.
Maximum vertical range	15,600 ft.
Rate of fire - theoretical	150 r.p.m.
Elevation	-10° to +85°
Traverse	360°
Length of bore	50 cal. (6 ft.)
Weight of shell	1.4 lbs.

Remarks: This gun is motor-drawn or self-propelled on a half-track vehicle. It fires self-destroying tracer ammunition.

47-mm. AA Gun

Specifications:

Weight in action	3,400 lbs.
Muzzle velocity	2,620 f.s.
Maximum horizontal range	11,695 yds.
Maximum vertical range	24,000 ft.
Rate of fire - theoretical	25 r.p.m.
Rate of fire - practical	15 r.p.m.
Elevation	-10° to +85°
Traverse	360°
Weight of shell	3.3 lbs.

Remarks: This gun originated in Czechoslovakia. It is tractor-drawn, but may also be self-propelled.

88-mm. AA Gun (See sketch)

Specifications:

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Weight in action	10,400 lbs.
Length of bore	65 cal. (18 ft. 9 in.)
Muzzle velocity	2,750 f.s.
Maximum horizontal range	16,000 yds.
Maximum vertical range	37,000 ft.
Rate of fire - theoretical	25 r.p.m.
Rate of fire - practical	15 r.p.m.
Elevation	-3° to +85°
Traverse	360°
Weight of shell	19.8 lbs.

Remarks: A tactical study of the gun has been previously made in this publication; see No 1, p. 29.

It is a high velocity dual-purpose gun equipped with a shield and has been used most effectively in the African campaigns. Its effectiveness is due to (1) mobility - towed on trailer by half track with ammunition in rear and can go into position very quickly by use of outriggers and demountable spade; (2) flexibility - (when not firing from trailer), can change from AT to AA fire in 5 to 6 seconds, traverse 360° and has specially trained crews who are able to take full advantage of its capacity to fire on rapidly moving targets; (3) high velocity - has penetrated all types of British tanks and also our own light and medium tanks.

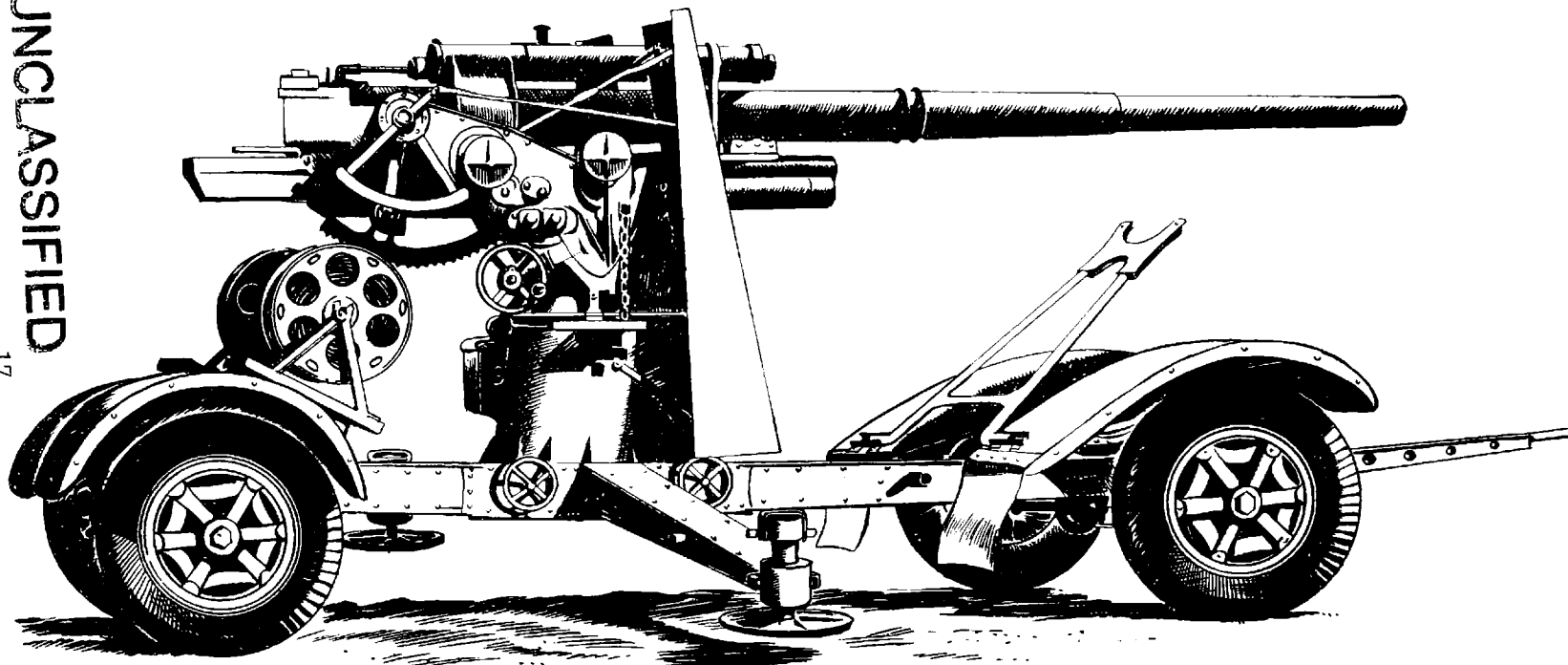
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In conclusion, the German Army has developed a system of balanced antitank protection which complements its system of antiaircraft protection. All units from the company to the division have an all-around "cubic space" (three-dimensional) protection against the greatest threats of modern warfare, the tank and the airplane.

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GERMAN 88-MM. ANTIAIRCRAFT-ANTITANK GUN

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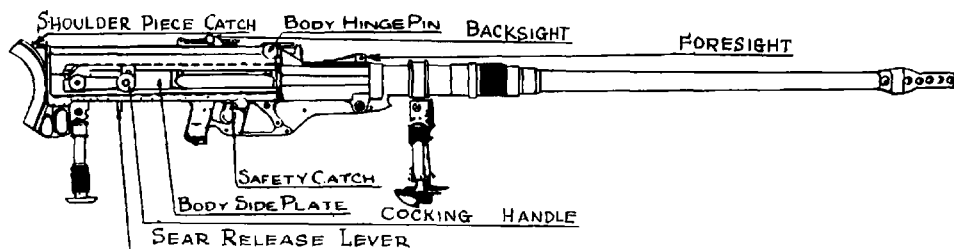
ANTITANK (TECHNICAL)

6. ITALIAN 20-MM. ANTITANK RIFLE (SOLOTHURN)

This antitank rifle is a self-loading, single-shot weapon. The rifle can be set at "safe" or "fire" by means of a thumb-operated catch on the pistol grip. (See accompanying sketch.) It is fired from the shoulder off the bipod. Some of its specifications are as follows:

Caliber	20 mm. (.79 in.)
Weight with empty magazine	120 1/2 lbs.
Overall length	7 ft. 1 in. (including recoil reducer)
Rate of fire	10—20 aimed r.p.m.
Sights (a)	Blade foresight, leaf backsight, leaf back-sight graduated to 1,500 meters
(b)	Telescopic sight mounted on bracket
System of operation	Recoil. Breech positively locked on firing by rotation of locking lugs
Feed	Magazine capable of holding 10 rounds, but normally loaded with 8 rounds only
Weight of H.E. and A.P. shell	4 ozs.
Muzzle velocity	2,750 f.s.
Penetration (armor plate at 500 meters, 90°)	30 mm.

Remarks: This gun is carried by two men and is sometimes found on tanks, armored cars and motorcycles. It is effective only in keeping mechanized patrols at a distance.



ITALIAN 20-MM. ANTITANK RIFLE (SOLOTHURN)

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CHEMICAL WARFARE (TECHNICAL)

7. GERMAN EYEGLASSES FOR USE WITH GAS MASK

The wearing of eyeglasses with a gas mask always presents a problem. The Germans, however, have devised a very simple and satisfactory solution. The lenses, conforming to the individual's particular optical prescription, are set in approximately circular rims joined by the usual bridge. In place of the usual hinged side members, there are double three-bar sliders through which are fastened the two ends of a loop of tape, 0.3 inches wide. The tape fits over the ear and is secured after adjustment by a hook at the end of each slider. Even though the tape may become twisted, a gas-tight fit of the facepiece can be obtained. The glasses and extra tapes are carried in a metal case.

8. TREATMENT FOR BLISTER GAS

Several small bakelite boxes taken from German prisoners in Libya were labelled "HAUTENTGIFTUNGSMITTEL" and contained ten small tablets. Upon analysis the tablets were found to be stabilised bleach, with an available chlorine content of 39.8 percent. These were identical with tablets found on German prisoners in Europe. They are referred to in German as "Losantin." Each box had ten tablets, and the normal issue is reported to be two boxes per man. The method of use for treating skin contaminated by blister gas, is printed on the label, and consists of making a tablet into a paste with water or saliva which is then applied to the affected part. After ten minutes it is washed or wiped off. The example of the incautious experimenter who ate several tablets under the impression that he was eating "Nazi food tablets" should NOT be followed.

It has been reliably reported that tablets of bleaching powder are distributed to workmen in all large German factories for skin application against the effect of mustard gas and lewisite. (See Tactical and Technical Trends, No. 1, p. 8.) A sample tablet was examined, with a label attached, bearing the inscription "CHLORKALKSTIFT D" (bleach pencil D).

This tablet was found to consist of bleaching powder which had undergone extensive decomposition through exposure. However, it would still provide slight beneficial effect on contaminated skin, though it is definitely inferior to the "losantin" tablets (see above) in bakelite containers issued by the Germans.

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9. FRENCH LIGHT ANTITANK MINE

The enemy has several times been reported to be using French light anti-tank mines, and it is likely that a considerable stock of them were acquired after June 1940. It is believed that the French had various mines of the general design described below, differing therefrom only as to dimensions and weight. No definite information is available concerning the explosive filler and firing pressure of these mines.

There follows a description of one of these mines.

Length of base plate	32.4 cm. (12.75 in.)
Width of base plate	22.2 cm. (8.75 in.)
Length of body	24.1 cm. (9.5 in.)
Width of body	14.0 cm. (5.5 in.)
Height of body	6.3 cm. (2.5 in.)
Material of body	pressed steel
Weight of filling	approx. 2.5 kg. (5.75 lbs.)
Weight of mine	6.5 kg. (14.5 lbs.)

The mine is rectangular in shape, and is provided with a base plate with holes at each corner for holding-down lugs. The lid (1) (see sketch) is corrugated, and is strengthened by two strips of metal (2) on the inside, and one strip (3) on the outside. The two inside strips carry a central hole over which are welded the pieces (4), which have indentations for the striker heads of the igniters. When the mine is in the "safe" condition, the channel-shaped aluminum safety bar (5) rests on the bodies of the igniters, and is prevented from falling out by a pin (6), and a ring (7). The lid (1) is held loosely by means of chains (8) attached at either end to the base of the mine. When the safety bar is removed, the lid descends until the striker heads (9) rest in the indentations in the pieces (4).

The igniter functions when pressure on the striker head (9) shears the pin (10). A strong steel spring (11) then forces the needle (12) on to the cap (13), and this in turn fires the detonator (14). Below the detonator is the exploder (15), which consists of a sealed metal box containing the exploder composition.

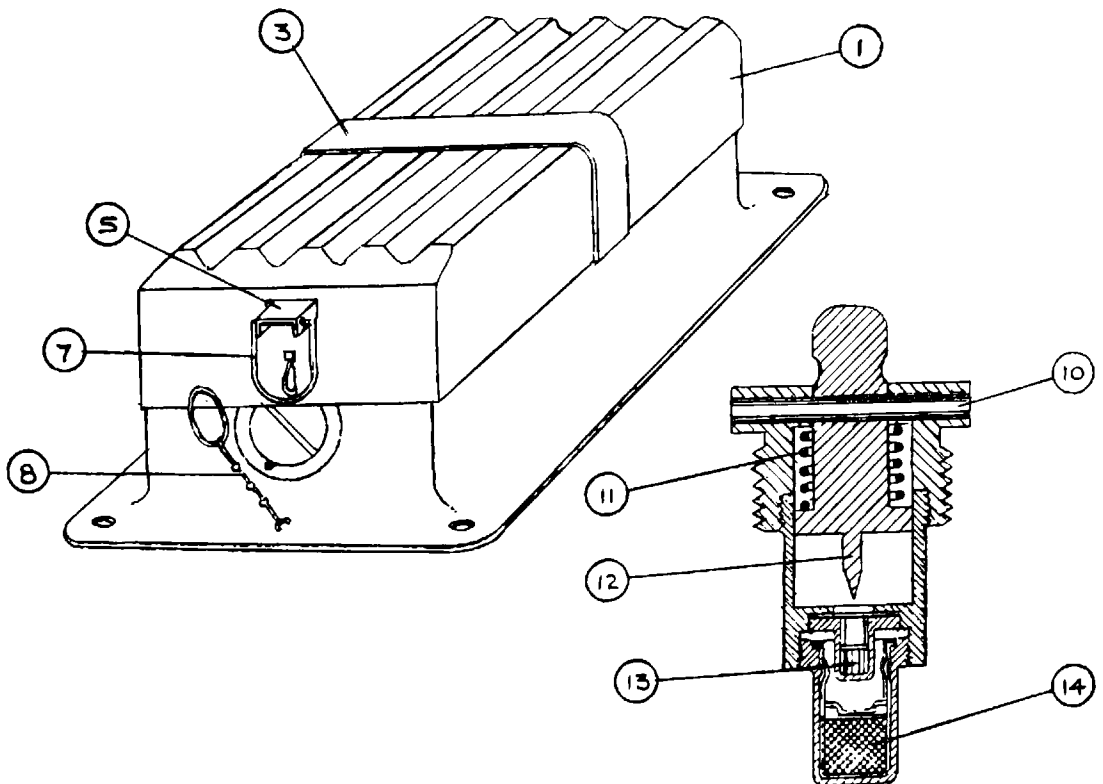
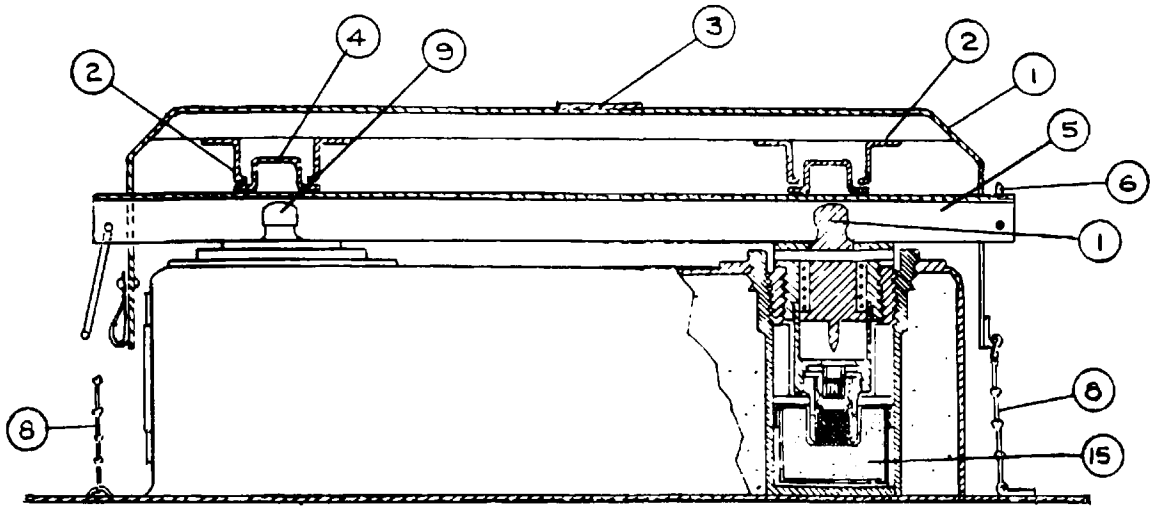
Method of functioning. The mine is actuated by pressure on the lid (1), which fires one or both of the igniters.

Method of handling. When armed, the safety bar (5) will be missing, and the lid will be resting on the igniters (9). No safety device is incorporated in the igniters. The method of disarming is as follows:

(1) Carefully detach the single chain at one end of the lid, and lift up the lid.

(2) Unscrew and remove the igniters, taking care not to exert pressure on the central striker head.

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FRENCH LIGHT ANTITANK MINE

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(3) Replace the cover.

COMMENT: Soon after the start of the war, in the fall of 1939, the French decided this mine was unsatisfactory. It was unsatisfactory chiefly from the standpoint of procurement, since the rectangular shape is difficult to manufacture, and the use of two fuses is wasteful of critical materials and facilities. Accordingly, the French abandoned this mine and adopted a cylindrical type, with one fuse, similar to the German "Tellermine", and to our own.

10. SYMPATHETIC DETONATION OF GERMAN TELLERMINE

Tellermines, the most common type used by the Germans, may often be neutralized by sympathetic detonation, thus avoiding personnel casualties caused by antilifting devices, faulty firing mechanisms, or simple carelessness.

The results of tests made by exploding 3 or 4 pounds of guncotton near Tellermines buried 4 to 6 inches underground showed that the sympathetic detonation took place at about 30 percent greater distances when the guncotton was 4 feet above the ground than when it was exploded at ground level.

COMMENT: Guncotton is the standard British explosive. TNT would give the same results.

11. ITALIAN FLAME-THROWER

An Italian flame-thrower, fitted to a light tank, has been examined and found to have a maximum range of 100 feet. It is reported as mechanically inefficient, using an excessively large amount of fuel, which is towed in a trailer behind the tank. The fuel consists of a mixture of gasoline and fuel oil.

If a sufficiently powerful centrifugal pump, as well as additional fuel, were made available, it is believed that the flame could be thrown a distance of 300 feet.

12. EARPHONE BOOBY TRAP

In North Africa a single-earphone head set was used by the enemy as a booby trap. It exploded when the nickel-plated screw at the back of the earpiece was unscrewed. It may have been intended to explode when the current was applied, as in normal use. The charge was sufficient to blow the victim's hand almost completely off. It is believed to have been of Italian origin.

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INFANTRY (TACTICAL)

13. THE GERMAN LIGHT DIVISION

A recent report and a number of isolated pieces of information from various sources seem to provide a suitable opportunity for a short study of the German light division. (In issue No. 3 of Tactical and Technical Trends a report on the reorganization of the 90th German Light Division explained the several features and organization of this unit.)

This study must be regarded as tentative only, since detailed information is lacking and there is reason to believe that the light division has not yet emerged from the experimental stage.

First origins.

Light divisions were first reported in action in the summer of 1941 on the Russian front, when von Reichenau's Sixth and Seventeenth Armies constantly employed them in the spearhead of the attack; at times, they were the only spearhead divisions at the head of a thrust by one or the other of these two armies. There seems little doubt, in view of this employment, that the type was an experimental one, entrusted to the commanders mainly responsible for it.

It is thought that the four light divisions which at first emerged on the Russian front represented two separate types. Both were based on a two-regiment organization, but in one case the two infantry regiments were each reinforced by an artillery battalion, whereas in the other there was an independent artillery regiment.

The Libyan development.

It is believed that the 90th Light Division was originally intended to be based on the two-regiment organization. However, its development, both present and contemplated, has been governed by the particular requirements of the operations in North Africa.

In the form now aimed at the 90th Light Division is to revert to a basis of three regiments. These are described as light infantry regiments, and consist of two battalions of four companies with a regimental headquarters company. In addition, there is an artillery regiment of two battalions only; a tank battalion is to be added; the other divisional units all depart to a greater or lesser extent from the organization met with in any other type of division.

The European development

No definite information is available as to any change in structure which the four original light divisions employed on the Russian front may have undergone. However during the period November 1941 to March 1942, three infantry divisions, which had suffered heavy casualties in Russia, and therefore had to be withdrawn from the front to reform, were transferred to eastern France and there reorganized as light divisions.

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The first of these three divisions to complete conversion discarded one of its three infantry regiments, and the two other regiments were re-organized as "Jaeger" regiments, which may be compared with the crack rifle battalions of the old Imperial Army. The converted regiments each consisted of three battalions of 5 companies (3 rifle companies, 1 machine-gun company, 1 "heavy" company) and a regimental antitank company. The artillery regiment and all other divisional units were motorized, but the infantry regiments were not; it must be assumed that motor transport for them would be provided, when necessary, from the G.H.Q. pool.

The second of these divisions was given the same infantry structure of two "Jaeger" regiments, but its artillery and other divisional units remained on a horse basis. The third division also is believed not to have been motorized.

The progress of the experiment.

It appears, therefore, that the light division is still in the experimental stage. For European warfare, the two-regiment organization has been approved, but it seems probable that the reinforced regiment has been found less satisfactory than the "normal" infantry regiment with a separate artillery regiment. As regards motorization, however, it seems that a final decision has still to be taken.

The significance of the experiment.

The reason for the creation of the light division is apparently based on the principle of fluidity in the employment of special troops (an outstanding characteristic of the modern German Army), and on an increasing preference for the two-regiment division in the spearhead force.

The Panzer, motorized, mountain, and light divisions are all based on the same two-regiment structure. It follows that a spearhead force drawn exclusively from these types will be far simpler to control than one which contains a number of three-regiment infantry divisions. At the same time, tank regiments drawn from the G.H.Q. pool can more easily cooperate with regiments, the basic structure of which is the same as the infantry regiment of the Panzer division, and the motorized division, which regularly works in close cooperation with tank units.

The light division is apparently not fully motorized, because the special motor transport battalions of the G.H.Q. pool can transport the "Jaeger" regiments whenever necessary, and there is no need to tie up motor transport by a permanent allotment.

Conclusion.

It is concluded, therefore, that the light division is the new type which may in time supersede both motorized and "normal" infantry divisions. It is as

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flexible and has as great striking power as the motorized division, but is less expensive to maintain. Just as the Germans effect great economy by reducing the divisional allotment of artillery by using the G.H.Q. pool to reinforce this division or that as the occasion requires, so likewise they would be able to economize in motor transport. They would also have a uniform structure in their attacking divisions, so that all are equally adapted for cooperating with tanks; and it may well be that the tank regiments, too may be largely transferred to the G.H.Q. pool with similar economy.

14. INFANTRY (TECHNICAL)

GERMAN PARACHUTES

Blueprints and plans of future campaigns could not be considered complete without the use of para-troops.

The types of chutes used by German troops of this branch consist at least of three kinds: marked R. Z. 1, R. Z. 16, and 36 D. S. 28. The R. Z. 1 appears to be the standard type.

The parachute equipment is divided into four main parts: the parachute proper (or canopy and rigging lines), the containing bag and pack, the harness, and the accessories.

The parachute itself consists of a silken canopy made up of a certain number of panels, each panel cut in the shape of a thin isosceles triangle with the apex removed. The R. Z. 1 and the 36 D. S. 28 (and probably the R. Z. 16) parachutes have 28 panels. Each panel has 4 gores (tapered sections), cut from a single piece of material in such a manner that warp and weft are both at an angle of 45° to the long axis of the panel. Panels are numbered serially in the lower corner, number 1 carrying in addition the special markings of the parachute. These are the manufacturer's stamp or trademark, which includes type, mark number, weight, date of manufacture, and identification number; the manufacturer's inspection mark, giving the date of the last factory inspection; and the Air Ministry stamp which gives the date of the Air Ministry inspection.

In a parachute with 28 panels there are 14 rigging lines which pass through the top vent, and are continued down through the seams on opposite sides of the canopy and then run as free lines to the lift webs. Each line is 21 meters (69 ft.) long, so that with such a canopy as the one described, 62 sq. meters (648 sq. ft.) in area, there is some 5 to 6 meters (16 to 20 ft.) of free rigging line on each side, between the periphery of the canopy and the lift webs.

When packed the canopy and rigging lines go inside the bag, which is fastened by means of a ring to the static line. The bag is then contained within the pack which consists of a base (next to the man's back) and 4 flaps which close over the bag.

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A further bag, in which the whole parachute is kept during shipment, is included among the accessories, and is removed when the person enters the plane.

The harness is made of webbing and consists of a belt with large buckle in front, two braces, two thigh straps, and a strap across the top of the chest. It is connected to the rigging lines by hemp lift webs. Each web is so made that its lower end forms an eye which fits into the appropriate "D" ring of the harness where it is secured by a screw, the free upper ends being joined to form two eyes. To each of the four eyes so formed, seven rigging-line ends are attached.

The parachutes are automatically opened by a static cord, 6 meters (20 feet) long, fastened to the inside of the plane, which pulls the bag away from the pack, releasing the canopy, and then becomes detached, taking the bag with it. After a drop of some 80 feet the parachute has become completely operative and the subsequent falling speed of a man and parachute is about 16 feet per second.

15. MECHANIZED VEHICLES (TECHNICAL)

TANKS OF THE RED ARMY

The New Heavy Tank. Twelve months of war have brought substantial changes in the design of tanks of the Red Army. The new heavy tank has been named the Klementi Voroshilov, commonly referred to as the "KV", is 22 feet long, 10.9 feet wide, 8.9 feet high and weighs 51.2 tons. It has a road-clearance of 1 foot 4 inches, and can ford streams 5-5 1/2 feet deep. Its length permits it to span trenches 12-14 feet wide.

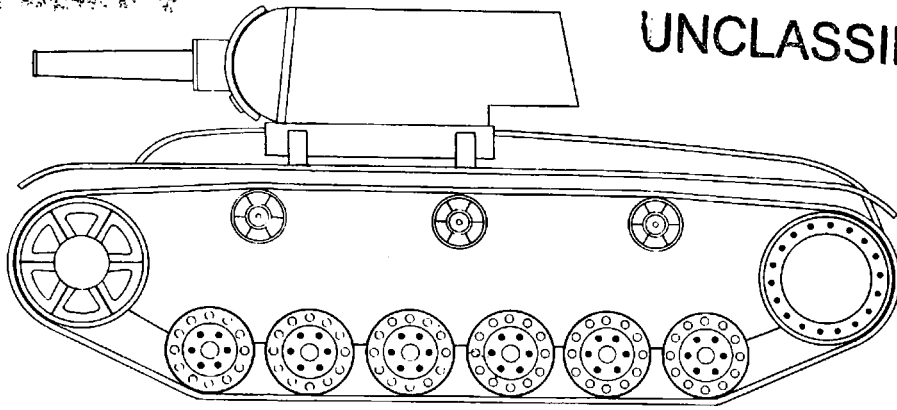
The "KV" is suspended on each side by six slotted wheels which give the outward appearance of double wheels. Each wheel is independently sprung on a rocker arm; the fin of the track is guided through the slot which prevents lateral distortion of the track. There are three return rollers and one idler wheel.

Improvements have been made in the track plate as well as in the method of interlinking them. There are no projections on the outside edges of the track plates on which snow or mud can become firmly lodged. The tread of the track has a grid pattern which insures a firm grip in snow and mud, and reduces side-slipping. Thus snow and mud cleats are not required.

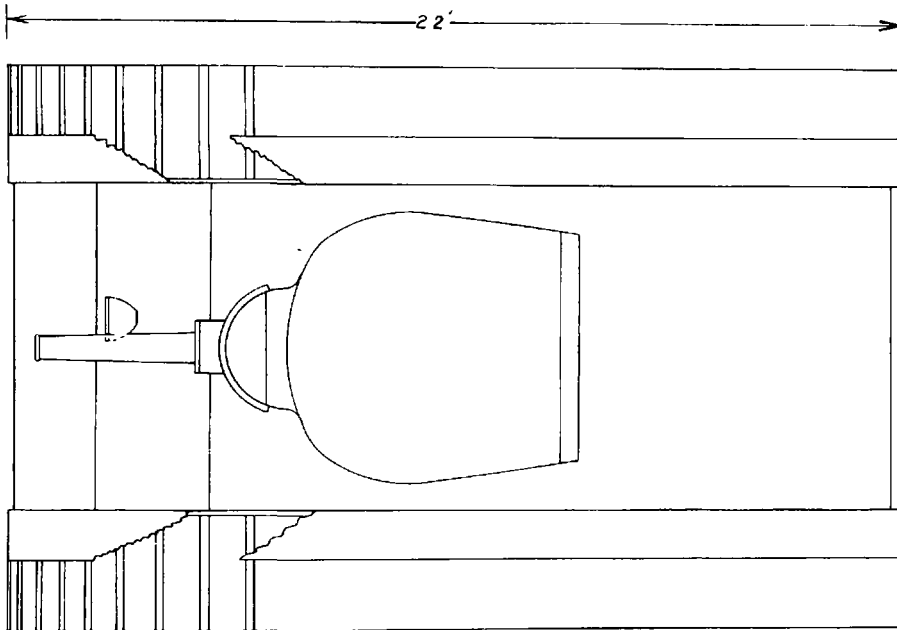
A new method of joining the track plates has been devised. Each section or plate of the track has nine links which are interlocked by a full-floating pin. The pin itself is held in position by small disks or lock washers, these in turn held in place by a spring collar fitting in a recess between each of the nine links

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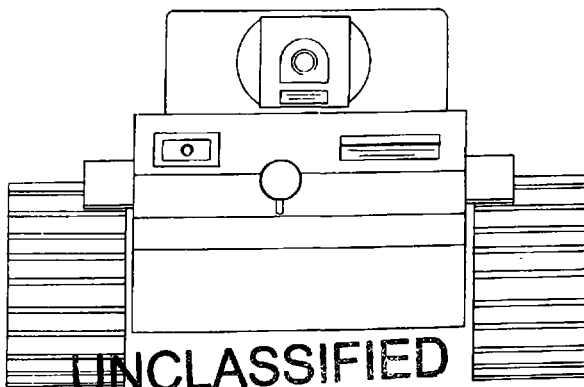


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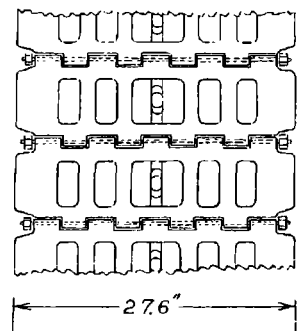


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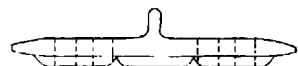
22'



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27.6"



NEW RUSSIAN HEAVY TANK (KLEMENTI VOROSHILOV)

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of the plate (see sketch). A broken track pin is thus prevented from working out of the links and causing the track to separate and immobilize the tank.

The contoured turret, cast in one piece, weighs approximately 10 tons. The frontal armor of the turret is 3.54 inches thick, making it exceptionally rugged and capable of withstanding sustained enemy fire. It can be revolved 360 degrees either by power or by hand. Heavy steel bars laid on edge are welded at the base of the turret to deflect shells which might cause it to jam.

Following are the data on armament and armor of this tank:

- (a) Turret armament: 76-mm. long-barrelled gun, (in some models of the KV a 152-mm. gun is installed in a specially designed turret).
One 7.62-mm. MG coaxially mounted with the gun.
One 7.62-mm. MG in rear of turret.
- (b) Hull armament: One 7.62-mm. MG forward.
Two spare 7.62-mm. guns as replacements for the turret or hull guns; or one may be mounted on top of turret for antiaircraft fire, or even used on a tripod for dismounted action.
- (c) Armor:
- | | |
|-----------------|------------------------------------|
| Front | 90 mm. (3.543 inches) |
| Sides | 75 " (2.952 ") |
| Top | 40 " (1.574 ") |
| Engine hatch | 30 " (1.181 ") |
| Turret sides | 75 " (2.952 ") |
| Rear end | 40 " (1.574 ") |
| Under sheathing | 30 to 40 " (1.181 to 1.574 inches) |

Ninety rounds of AP and incendiary shells are carried for the cannon, the former being stacked behind the loader, the latter being distributed around the turret, under the floor boards, and in the driver's compartment. 3,000 rounds of machine gun ammunition in drums are carried in the turret.

The "KV" is propelled by a 600-horsepower 12-cylinder V-type diesel engine driving through a transmission and final drive to the sprockets at the rear of the tank. The motor is reported to be very noisy. The tank is equipped with both electric and compressed air starters.

It has five forward gears (four regular and one emergency), and one reverse gear. The tank carries 158.5 gallons of fuel inboard and can carry an additional supply in saddle tanks which can be discarded when empty, or prior to going into action. The normal range of action without saddle tanks is 110 to 125 miles across country. A maximum speed of about 21 miles per hour can be attained on an improved road.

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The "KV" carries a crew of five consisting of the commander, driver, loader, gunner, and radioman. A mechanic sometimes makes a sixth member of the crew. The posts of the commander, loader, and gunner are in the turret. The driver and radioman ride side by side in a forward position.

The radio is in front on the left of the driver. The antenna is a vertical type mounted forward on the tank. Communication within the tank is by telephone. Inter-tank communication is visual, by either arm-signals or flags.

Tank warfare has taught the Russians lessons which have influenced their tank design. The turret is located well forward to permit tank infantrymen (desyanti, see Tactical and Technical Trends No. 3, page 44) to use it as a shield while riding atop the tank. Every provision has been made to prevent unwelcome riders from getting aboard. There is a lack of external fittings, tools, sharp projections, etc.; this meets the double purpose of eliminating hand grips for enemy hitch-hikers and the chance that a fire bomb or other missile could lodge on the tank. The fender of the tank is very narrow so that "tank hunters" who seek to jump aboard run the risk of being caught in the track. The newer American sponson-type tanks have no fenders as such and have solved these problems largely through basic design. As a further protective measure for the tank crew, the hatch in the top of the turret is so constructed that it cannot be opened from the outside. A special tool is required to open the hatch from the inside.

The Medium Tank - T-34. High maneuverability and relatively spacious interior arrangement have made this tank a favorite of Soviet tank crews. The Germans themselves have expressed the opinion that the T-34 was the most effective tank they have encountered.

The T-34 is a modified Christie-type tank. It has an overall length of 19 feet 1 inch and is 9 feet 8 inches in width. The low silhouette of the tank (8 feet 6 inches), beside maintaining 1 foot 3 inch road clearance, is an obvious advantage. The tank weighs 29.7 tons and has a maximum speed of 28-34 miles per hour on roads and 18.5 miles per hour across country. It can surmount the same cross-country obstacles as the "KV" except that its length limits the width of the trenches it can jump to about 11 feet. (See sketch.)

The turret is of the built-up, welded type, equipped with two rotating periscopes mounted on top. Two visors, fitted with bulletproof glass are located on the sides of the turret. The turret may be revolved 360° to permit all-around fire.

The T-34 is powered with a 500-HP diesel motor similar in design to that in the "KV" and can be started either by electricity or compressed air.

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The track also is similar to that used on the "KV." It is narrower (21 1/2 inches wide) but has the same design and method of interlinking the plates.

Carrying its normal capacity of 120 gallons of diesel oil, the radius of operation of the T-34 is 150-175 miles. However, this range may be extended by carrying extra fuel tanks strapped to the hull above the fenders.

The tank is manned by a crew of four. The commander, who also acts as loader, and the gunner take stations in the turret. The driver and radio operator are in the forward seats of the hull.

Radio is used only to communicate with higher echelons. Inter-tank communication is by visual signal, while telephone and laryngophones are used between members of the crew.

Following are data on the armament and armor of this tank:

- (a) Turret armament: One 76-mm. gun (for which 77 rounds of AP and HE shells are carried). One 7.62-mm. MG mounted coaxially on the right of the gun.
- (b) Hull armament: One 7.62-mm. MG in front on the right of the driver (ball mounted), one spare 7.62-mm. MG. 3,780 rounds of ammunition for the machine guns are carried.
- (c) Armor:
- | | |
|--------------|----------------------|
| Front | 50 mm. (2.00 inches) |
| Sides | 20 " (.77 ") |
| Top | 20 " (.77 ") |
| Engine hood | 20 " (.77 ") |
| Turret sides | 52 " (2.04 ") |
| Rear end | 45 " (1.77 ") |

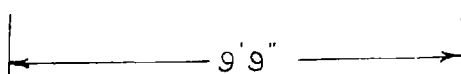
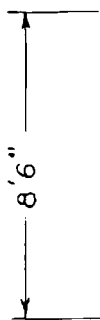
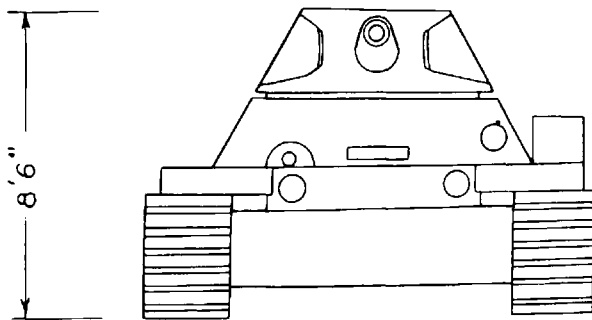
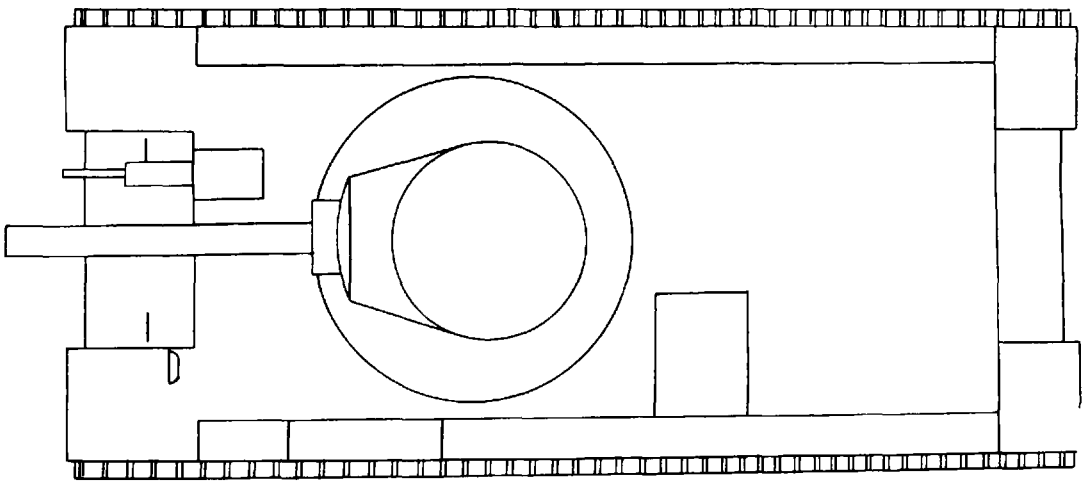
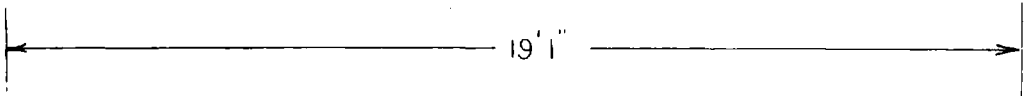
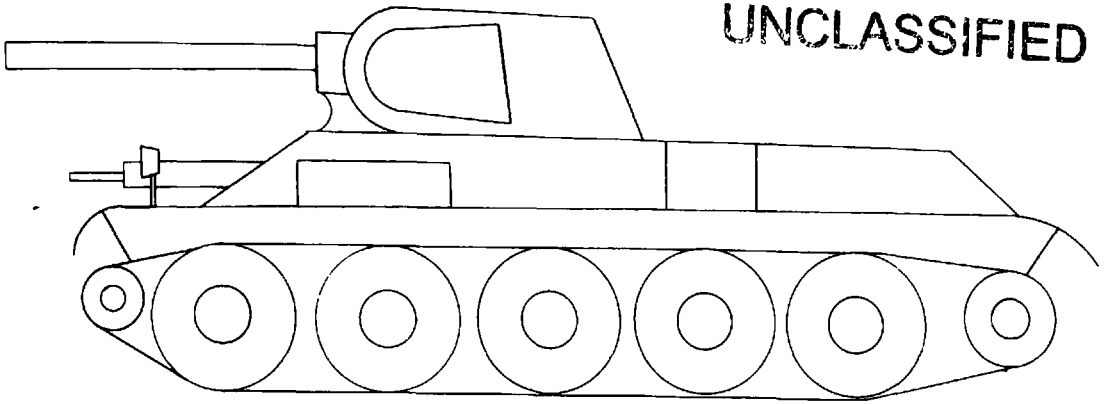
The Light Tank - T-60. The Soviet Light Tank (T-60) is essentially a gun carrier. It weighs 5.9 tons, carries a crew of two, and is powered with a heavy six-cylinder gasoline engine. It has a radius of action of from 75 to 100 miles and a maximum speed of 24 miles per hour. Its armament includes one 20-mm. automatic cannon and two 7.62-mm. air-cooled machine guns. The armor ranges from .6 to .8 inches in thickness.

The Russian Light Tank-T-26B used as a Flame Thrower. Many experiments have been conducted by the Red Army to determine the advisability of converting the T-26B (8.4-ton) tank into a flame thrower.

This tank normally carries two 7.62-mm. machine guns, or one 37-mm. anti-tank gun and one 7.62-mm. MG. If the tank is converted to a flame thrower only one machine gun can be carried.

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RUSSIAN MEDIUM TANK (T-34)

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On the experimental model of the T-26B, the (106-gal.) fuel tank for the flame-throwing apparatus was mounted on the tank instead of being towed on a trailer.

Various tests on flame throwers using crude oil (or some similar fuel) show that 10 gallons of fuel per second are consumed under high pressure through a 1.25-inch nozzle, to obtain a range of 100 yards. At this rate, the blast could be expected to last about 10 to 11 seconds. By lessening the pressure, the range is reduced to 25-40 yards and the stream of flame lasts longer.

The question arises whether it is worth-while sacrificing the fire-power of one machine gun for such a short-lived flame.

16. GERMAN MODIFICATION OF FRENCH CHAR B TANKS

It is reported that the Germans are modifying French heavy tanks of the Char B (30-ton) type.

The 75-mm. gun is being transferred from the hull to a new turret. This would be a logical improvement. The gun in its previous position could only fire forward. Moreover, owing to the low mounting in the hull, it could not be fired from the defiladed position, and when crossing antitank trenches the gun barrel was apt to become clogged with earth.

17. MEDICAL

STIMULANTS FOR MEMBERS OF THE GERMAN LUFTWAFFE

A firm in Brussels is reported to be the distributor of the stimulant called "Pervitin" (see page 19, Tactical and Technical Trends, No. 4) used by members of the German Luftwaffe. It is prepared in the form of a pellet or pill. The manufacturer is Temmlerwerke of Berlin. The following ingredients are used in its manufacture:

1 - phenyl - 2 - methylaminopropane hydrochloric	0.003
Saccharin lactis	0.045
Amylum	0.012

COMMENT: In this country, "Pervitin" is believed to be similar in chemical structure to our drug Benzedrine. The British consider Benzedrine and also Methedrine to be helpful in temporarily increasing physical vigor, relieving fatigue and preventing sleep.

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18. JAPANESE GRENADES

Grenades are particularly useful to the close-in tactics of jungle fighting and the Japanese have used them extensively in their operations in the southwest Pacific and Burma areas, especially with grenade throwers. The following information on Japanese grenades is therefore of interest.

(a) Hand grenade. A grenade examined in Burma is described as follows (see accompanying sketch): The grenade is cylindrical in shape and has a grooved cast-iron body. A plug (10) is screwed into the top of the body through which extends a brass igniter tube (4). The striker (5) with holder (3) creep spring (6) and percussion cap (7) are located in the upper part of the tube while the lower portion contains the fuse and detonator (14). The tube is closed at the top by a light brass cover (1) crimped near the middle to fit into a groove in the tube and held in position by a safety pin (2). The safety pin supports the striker holder and prevents the downward movement of the striker on to the percussion cap. The fuse and detonator are separated by a perforated steel disk (15). The filling (16) is composed of T.N.T.

The dimensions and weights are:

Maximum diameter	1.97 in.
Overall length	3.78 in.
Weight	16.5 oz.
Weight of filling	2 oz.

Method of arming. Withdraw the safety pin. The spring is then held at half compression by the brass cover. Give the head of the ignition tube a sharp blow, further compressing the spring and driving the striker on to the percussion cap. The fuse, with a delay of 4-5 seconds, is then ignited and the filling detonated.

To disarm grenade. Remove safety pin and cover. Withdraw striker holder and spring. Unscrew plug at top of grenade and withdraw together with ignition tube. Withdraw copper tube from bottom of plug and remove detonator. Remove filling.

Variant type. A grenade examined in England sometime ago was slightly heavier, but otherwise was very similar in appearance and dimensions. A cartridge container, diameter 1.02 in., length 1.22 in., screwed into the base of the body, contained a propelling charge and percussion cap. This is presumably fitted when the grenade is fired from a discharger, probably the 1.97-in. grenade thrower, model 89.

(b) Stick grenade. A grenade of this type was examined in the Far East. (see accompanying sketch.) It is similar in design to the German stick grenade 24, the main points of difference being as follows:

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Japanese
grenade

German
grenade 24

Length of stick	10 in.	5 in.
Length of container	4 in.	3 in.
Diameter of container	2.75 in.	2 in.
Length overall	1 ft. 2 in.	8 in.
Weight	1 lb. 2 oz.	1 lb. 3.5 oz. (approx.)
Weight of filling	6 oz. (T.N.T.)	2 oz. (Lyddite)
Thickness of casing	.08 in.	.25 in.

Both grenades are operated by a friction-igniter, powder-delay system and have a delay of approximately 4 1/2 seconds.

The thick cast-iron casing and smaller charge of the Japanese grenade indicate that it is designed for fragmentation, in contrast to the German grenade which relies on blast for its effect.

Method of arming. Remove screwed metal cap from base of stick and take out wire ring. Insert middle finger in ring and retain when throwing grenade. When grenade is thrown, cord attached to ring will be pulled out, igniting fuse which burns for about 4 seconds.

To disarm grenade. Remove the wax around the joint between stick and container and take out three screws located about 1/2 in. from the base of the container. Hold the grenade by the handle and tap off the container. Remove filling. Remove screwed metal cap from base of stick and cut cord away from ring. With a metal rod, push out igniter, fuse, and detonator complete.

(c) Armor-piercing magnetized grenades. These grenades are designed to detonate while clinging to the armor as a result of their magnetic qualities. It has been reported that the Japanese have 2 types, one shaped like a flat-sided disk, the other like a bun with a flat base. The former must be actually placed against the armor by the soldier; the magnetic qualities of the other grenade are such that it can be thrown from a distance of 10 yards, but since the flat surface must come in contact with the armor this form of attack is not likely to be successful. It is thought that these grenades are not likely to be very effective since, among other things, even a small air space between the armor and the grenade would defeat its penetrating power.

While information has been received confirming the existence of these grenades, there is no evidence that they have been used in battle.

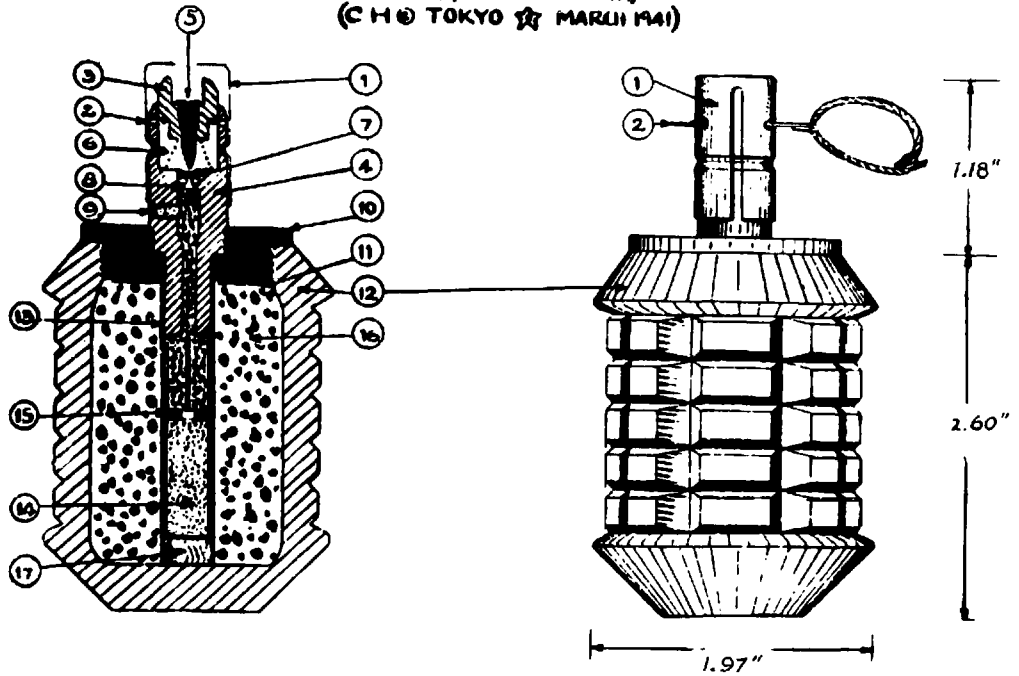
19. GERMAN GRENADE FIRED BY SIGNAL PISTOL

It is believed that the German hollow-charge armor-piercing grenade, which is usually fired from a rifle, can also be fired from a signal pistol. This

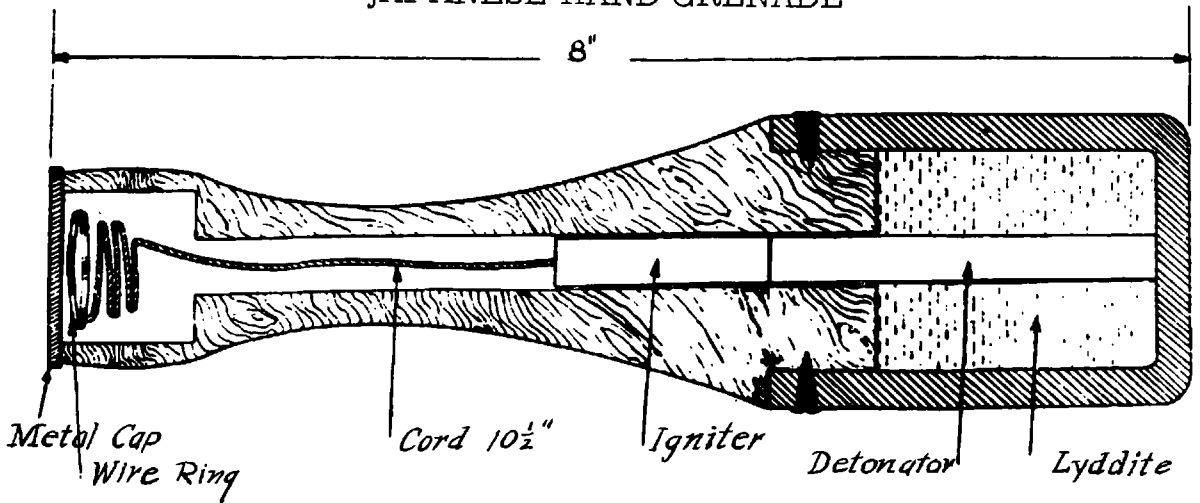
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These Characters Inscribed on Tube
 "CH 田 大 3 大 + H 3"
 (CH 田 TOKYO 田 MARUI 1941)



JAPANESE HAND GRENADE



JAPANESE STICK GRENADE

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belief is based on captured documents which have established the existence of attachments for firing grenades from these pistols.

20. 12-KILOGRAM GERMAN ANTIPERSONNEL BOMB

There are apparently two types of the German 12-kg. (26.4-lb.) anti-personnel bomb. One has walls of solid steel. The other has two concentric containers, each 0.1 in. thick; the intervening space is filled with steel pellets embedded in concrete. The inner container is coned at the base and the outer one closed by a base plate.

21. QUARTERMASTER (TECHNICAL)

WATER RATIONS

Desert warfare requires that water be used on a scale to meet the needs of the fighting forces, but within the allowable limits imposed by the scarcity of supplies.

One captured document shows the issue of water to the 11th Battalion, German Fifth Tank Regiment in Libya, as follows:

Radiator Water

<u>Vehicle</u>	<u>Container</u>	<u>Liters</u>	<u>Gals. (British) approx.</u>
Cars	1	20	4 1/2
Trucks and			
Mark I & II Tanks	2	40	9
Mark III & IV Tanks	3	60	13 1/2

As carried in the water supply columns these quantities are doubled per vehicle.

Washing Water

Approximately 2 gallons per man for 3 days.

Cooking and Drinking Water

The total for the Battalion is about 2,800 gallons, carried in 520 containers.

Additional Reserve

Approximately 4,212 gallons. (The total of 14,100 gallons is so high that it is unlikely to be continued for long.)

GLOSSARY

NAMES OF PLANES IN SERVICE
WITH THE BRITISHBOMBERS OF BRITISH MANUFACTUREHeavy Bombers⁽¹⁾

Halifax	4 engines
Lancaster	4 engines
Manchester	2 engines
Stirling	4 engines

Medium Bombers⁽²⁾

Mosquito	2 engines
Wellington	2 engines
Whitley	2 engines

Light Bombers⁽³⁾

Blenheim	2 engines
Hampden	2 engines

Torpedo Bombers

Beaufort	2 engines
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- (1) Weight empty, over 20,000 pounds
(2) Weight empty, 12,000-20,000 pounds
(3) Weight empty, under 12,000 pounds

FIGHTERS OF BRITISH MANUFACTURENight Fighters

Blenheim (long range)	2 engines
Defiant	1 engine

Fighters

Beaufighter	2 engines
Hurricane	1 engine
Spitfire	1 engine

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BOMBERS OF AMERICAN MANUFACTURE

<u>American Name</u>	<u>British Name</u>	<u>No. of Engines</u>
<u>Heavy Bombers*</u>		
B - 17	Flying Fortress	4
B - 24	Liberator	4
<u>Medium Bombers*</u>		
B - 26	Marauder	2
B - 25	Mitchell	2
B - 34	Ventura	2
<u>Light Bombers*</u>		
Martin 167	Maryland	2
Martin 187	Baltimore	2
D.B. - 7	Boston I	2
D.B. - 7 A	Boston II	2
D.B. - 7 B	Boston III	2
B - 14	Hudson	2
<u>Dive Bombers</u>		
Vultee (V-72)	Vengeance or Georgia	1

*American classification and not by weight.

FIGHTERS OF AMERICAN MANUFACTURE

<u>American Name</u>	<u>Single Engine</u>	<u>British Name</u>
P - 39		Airacobra
Brewster 339		Buffalo
P - 40 B.C.		Tomahawk
P - 40 D.E.		Kittyhawk
P - 40 F		Warhawk
P - 43		Lancer
P - 66		Vanguard
P - 51		Mustang
<u>Twin Engine</u>		
P - 38		Lightning I
P - 38 D.E.F.		Lightning II
D.B. - 7 (night fighter)		Havoc I
D.B. - 7 B (night fighter)		Havoc II

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SECTION II

THE SIEGE OF SEVASTOPOL

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(German Accounts of the Operations Against Sevastopol,
June 7 - July 4, 1942)

Eyewitness accounts appearing in the German press of the operations against Sevastopol between June 7 and July 4, 1942, permit the Military Intelligence Service to reconstruct this siege operation in a detail not possible for any other operation of the Russian-German War. German press accounts term the fortress of Sevastopol the "strongest single fortress of the world" and unanimously declare neither the Maginot Line nor their own "West Wall" compared in strength with this mightiest of Russian fortresses.

The fortress of Sevastopol was initially constructed in the two decades between the years 1806 and 1825. These ancient forts showed great strength in the Crimean War, 1854 - 1856, when they held up an allied army composed of British, French, Italians, and Turks for a period of nine months. Since 1939, the Soviets devoted especial attention to the modernization and enlargement of this fortress, recognizing that, with the coming of airpower, the retention of the Crimea was all-important for control of the Black Sea. An examination of the map discloses that the island-like Crimean Peninsula lies in the middle of the Black Sea, and that an air force based on Crimean air fields can control the maritime trade routes across the Black Sea in any and all directions.

In November, 1941, the Eleventh Germany Army under General of Infantry, von Manstein, after hard fighting forced the Russian fortified lines across the Perekop Isthmus at the north end of the Crimean Peninsula. Following this penetration, von Manstein's troops advanced rapidly to the south and captured the city of Simferopol, the capitol of the autonomous republic of the Crimea. The bulk of the Russian armies defending the Crimea, then withdrew to the eastward into the Kerch Peninsula, and eventually were forced to withdraw completely out of the peninsula when the Germans captured the city of Kerch. While these operations were in progress, a group of Russian divisions, cut off from Kerch, withdrew within the Sevastopol defense lines. While von Manstein's operations against Kerch were in progress, Sevastopol was contained by a small German force.

Early in December, the bulk of von Manstein's army returned westward from Kerch and began offensive operations against the fortress. This initial attack had, at first, some success, and one of the outer forts, "Balaklava" was captured, but German offensive operations had to be completely halted, when a larger Russian counter-offensive began from the mainland. Taking advantage of their maritime control of the Black Sea, powerful Russian forces were landed simultaneously in several places on the Crimean Peninsula. The city of Kerch was recaptured, as well as the towns of Eupatoria and Feodosia to the north and east of Sevastopol respectively. The entire German position in the Crimea, for a time, appeared to be threatened. All reserves had to be thrown toward Feodosia and Eupatoria. In consequence, the German forces attacking Sevastopol retired to their blockading lines some miles in front of the outer Russian fortified lines.

From December until June, hostilities in the Sevastopol region were of a minor nature. Occasionally, local counter-attacks were launched by the

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Russians, but these attained no great success. The Germans, on their part, found themselves confronted with a serious guerrilla war in their rear areas, where Russian guerrilla bands roaming the Jaila Mountains attacked German supply columns, troop headquarters, and base depots. In January, 1942, the German position gradually improved, as a result of this recapture of Feodosia and Eupatoria, and the suppression and extermination of the Russian guerrilla bands.

In May, 1942, the main body of the army of General von Manstein resumed offensive operations with a carefully planned and well-executed attack against the three Russian armies which had reoccupied (in December, 1941) the Kerch Peninsula. The German press unanimously declares that this local offensive was one of the best prepared and well-executed attacks of the entire war, and that complete success was achieved; three Russian armies being completely destroyed and 165,000 prisoners captured. This victory, it is declared, ended for all time the Russian threat to relieve Sevastopol. Preparations for the storming of Sevastopol were at once begun by von Manstein's army, and the opening of the attack was scheduled for the first week in June. At least eight German infantry divisions, three Roumanian divisions, and one German armored division were assembled in the western Crimea for this operation.

The strength of the air force units which were assembled in the Crimea to support the ground army is not entirely clear; but it would appear, from German accounts, that its strength could not have been less than 1500 planes. These air forces were organized as the VIII "Close Support" Air Corps, and were under the command of General of Aviators, von Richthofen. A small naval force, comprising German, Italian, and Roumanian units, the largest of which were destroyers, operated as a unified fleet under the command of the Roumanian Vice-Admiral Georgescu.

As in the Cretian operation, of the year 1940, all branches of the German armed forces served as a unified command; -- a task force, under the command of General von Manstein.

The terrain within and around the fortress lines of Sevastopol presents great difficulties to an attacking army. Sharp hills and deep ravines alternate across the landscape. Vegetation is scarce. The Russians had utilized the months of the winter 1941-1942 to greatly strengthen the existing fortifications. Several deep and broad tank trenches had been constructed, barring the way to the German tanks. About 137,000 tank mines were also laid within the fortified zone. German reports state that, by May 1940, Sevastopol was defended by 19 modern forts and 3,597 pillboxes and other lesser defense installations of a permanent character.

The principal weakness of the fortress lay in the fact that it was cut into two parts of equal size by the Sevastopol Harbor, a deep and broad fjord-like channel of the Black Sea, which ran for some six miles inland. Sevastopol city lay on the south shore of this bay. Only a narrow strip of land connected the two portions of the fortress.

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During the month of May, the German High Command assembled an immense amount of special material and equipment to assist their troops in overcoming the fortress' works which confronted them.

The tactical plan of campaign envisaged a deep and rapid penetration by the German ground forces of the northern half of the fortress down to the northern shoreline of Sevastopol Harbor. While this main attack was in progress, German and Roumanian elements confronting the southern and eastern fortress were expected to advance from the east and capture the Sapon Hill, an elevation which dominated the terrain between Sevastopol and Balaklava. A very important role was given the German Air Force. The Russian air units stationed in Sevastopol were perforce few in number and restricted to operation from a very few air fields. The Caucasus was too far away to permit the Russian air units stationed in that region to intervene in the fighting at Sevastopol. The neutralization of the minor Russian air units stationed at Sevastopol therefore, appeared to the German High Command a relatively simple matter. The bulk of the Air Force was, therefore, to be used to support and cover the attacking German ground forces. In particular, the Air Force was given the mission of neutralizing or destroying the permanent fortified works in the area of the fortress lying to the north of Sevastopol Harbor.

It is known that as far back as 1936, the German Air Force was developing special bombs and fuses for use against permanent fortifications. There is evidence in the German accounts of the Sevastopol operations to suggest that these special bombs and fuses were used extensively. It is also of great interest that the Germans speak of their Air Force in these operations as a "rolling barrage controlled by radio".

General von Manstein planned to use his tank forces only sparingly in the coming attack. The terrain was highly unfavorable for tank operations, and the pillboxes, antitank mine fields, and forts indicated that pioneers and infantry would prove more effective than tanks. It is German doctrine, moreover, not to employ tanks in attacks against lines of permanent fortifications.

The artillery preparation for the storm began early on June 2d and lasted until 3 o'clock on the morning of June 7th, when infantry and pioneers moved forward in the northern sector against the Russian outpost line located on the south bank of the Belbek. German accounts state that the amount of artillery employed and the intensity of fire delivered rivaled that used in any battle on the west front in the First World War. While the bulk of the fire, both from artillery and airplanes, was placed on the front lines and the Russian forts on the high ground south of the Belbek stream, the long range artillery and heavy bombing squadrons concentrated on the city of Sevastopol itself; in particular, the navy yard and the commercial docks.

Despite the intense artillery preparation, the German infantry and pioneers, as they moved forward, could do little more than overrun the Russian outpost line. By June 8th, it had become clear that further artillery and air preparations were necessary before the forts themselves could be stormed. In

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particular, Fort Maxim Gorki in the extreme northwestern end of the Russian defense line, succeeded in repulsing all the infantry and pioneer attacks which were made against it. Maxim Gorki is declared by the Germans to have been stronger than any individual fort in either the Maginot Line or their own "West Wall". Its armament consisted of two armored turrets of battleship construction, each containing two 30-centimeter (11 inch) guns. Underground, there were four levels which were provided with all necessary conveniences for the garrison as well as heavily armored ammunition chambers.

While the German infantry and pioneers were advancing slowly against the line of forts south of the Belbek, other German and Roumanian units attacked the southern half of the fortress. This southern attack began on June 11th. Initially, these attacks were on merely a local scale and aimed at advancing the line in the decisive direction of Sapon Hill. So determined and skillful was the Russian resistance that this southern advance also could make only gradual progress. Great difficulties were encountered by the Germans in particular in capturing the Russian cave pillboxes built into the sides of hills and ravines.

It became clear to the Russians, as the attack developed, that the greatest threat to the fortress came from the north. In consequence, the bulk of the Russian troops were bit by bit transported across Sevastopol Harbor and thrown into the battle raging for the line of forts on the heights to the south of the Belbek.

The decision in this crucial battle came on June 18th, when German infantry and pioneers, after a very heavy artillery and air concentration, succeeded in capturing Fort Maxim Gorki. Previously, Forts Stalin and Siberia had been captured. German accounts give the credit for the fall of Maxim Gorki in equal measure to the ground forces and to the air. In particular, however, a dive-bomber pilot is declared to have sealed the fort's doom when he scored a direct hit on the southern turret of the fortress, putting it out of commission and enabling pioneers and infantry to force their way into the interior of the fortress. Here underground the struggle continued for four days until the last resistance of the garrison was extinguished.

It is thought desirable, at this time, to review the special German technique for reducing fortresses. The special weapons and the tactical methods for this mission were developed between the years 1935-1939. All infantry and pioneer (engineer) units of the German army devoted a portion of their training schedule to rehearsing attacks on modern fortifications. The time and energy spent by the Germans on this special form of warfare was believed by them to be essential inasmuch as it was their intention, sooner or later, to breach the French Maginot Line and other permanently fortified lines by a frontal assault.

The reduction of Sevastopol constitutes the crowning achievement of this "assault technique". Assault technique is a team proposition. The team--consisting of infantry, antiaircraft artillery, dive-bombers, and other elements--operates to the end of placing its engineer component into position where the

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engineers can apply their explosives directly to the enemy works. The use of engineers, and engineer materials and weapons, in this strictly combat capacity is the distinguishing characteristic of German assault technique.

As has been indicated, the forts of Sevastopol were protected on all sides by dense systems of obstacles: wire, ditches, mines, and others. These obstacles were deranged and to some extent destroyed by the violent bombardments, both from the air and from artillery, which preceded the actual assaults. It was then the mission of the engineers to move forward ahead of the infantry and complete the clearing of paths through the obstacle belts. The detection and removal or neutralizing of mines must have been the most difficult part of the job. For this operation, the German engineers probably depended chiefly on distributed charges of explosives ("Bangalore torpedoes"), which, pushed ahead and detonated, "induced" in turn the detonation of nearby mines. The entire operation demonstrated once again that under present conditions in Europe, a principle function of combat engineers is the removal of obstacles, in the face of enemy resistance.

The fall of Fort Maxim Gorki opened for the Germans a path to Sevastopol Harbor. Advanced elements of the assaulting infantry reached the shoreline on June 20th. By June 21st, the last of the main northern forts (Fort Lenin) was captured. The entire city of Sevastopol and the naval base of the Russian "Black Sea Fleet" now lay under the fire of German guns. To all intents and purposes, the fortress was doomed. Nevertheless, the Russian resistance gave no indication of diminishing. Even though the struggle was hopeless, the Russian commanders and soldiers never thought of surrendering.

The German forces attacking the southern half of the fortress now began to redouble their efforts. Attack after attack was launched toward the village of Inkerman. Gradually, bit by bit, ground was gained in the direction of the city, and on June 28th, advance infantry elements succeeded in crossing Chernaya Creek and securing lodgment on the line of hills immediately east of the city of Sevastopol. Flanking fire from German artillery stationed north of Sevastopol Harbor assisted this infantry advance. Nevertheless, the Russians successfully maintained themselves on the ridge of hills west of the Chernaya for several days. It appears that General von Manstein became convinced that still further measures were necessary to end Russian resistance.

On the night of June 28-29, the German High Command launched its decisive blow;--an amphibious operation under cover of night and a dense artificial smoke screen across Sevastopol Harbor. This attack was made in conjunction with renewed infantry assaults from the east. This two-pronged assault succeeded in placing in German hands the whole of the important ridge lying west of the Chernaya. In effect, the fortress had now fallen.

The Germans gave much of the credit for the success of this attack to their skillful employment of their power-driven motor launches ("stormboats") which transported the assaulting infantry and pioneers to the south bank of Sevastopol Harbor. This boat, with its 50-horsepower motor, its 12-man

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capacity, its 30-mile speed, was developed in great secrecy by the Germans during the late peace years, and has been one of the real revelations of this war. The boat was first employed in the crossing of the Vistula by the Fourth Army at Culm in September of 1939. In June of 1940, at the crossing of the Rhine near Breisach, the Germans used the stormboat in great numbers, and showed that, through such use, they had altered profoundly the tactics of the forced crossing of wide rivers. The speed with which assault waves were landed on the hostile bank was unprecedented.

The use of the stormboat in the crossing of Sevastopol Harbor at the storming of Sevastopol appears to have followed the form of the Rhine crossing. That is, the boats were organized in "stormboat companies". The crews remained with the boats, and continued to ferry loads back and forth across the bay until conventional type ferries could be put in operation.

An important supplement to the use of the stormboat at Sevastopol Harbor was the laying of a dense smoke screen to conceal the operation. Since stormboats betray their general position by the noise they make, smoke to screen them becomes especially important. It is possible that the heavy smoke screen at Sevastopol Harbor was partly, at least, a result of the considerable losses suffered by stormboat crews in the Rhine crossing near Breisach.

Conventionally, the crossing of an initial assault wave is accomplished in utmost silence, the assault boats moving normally in twilight, with muffled oars. It will be observed that in the stormboat, silence is sacrificed for terrific speed.

On July 1st, the German troops, advancing on Sevastopol from the east, captured Fort Malakhoff on a dominating height just to the southeast of the city. In 1855 it had been the fall of this fort which ended the earlier siege. Again in 1942, the fall of Fort Malakhoff ended the city's resistance. Sevastopol was occupied on July 2d.

Russian resistance still did not end, however, with the fall of the city. According to German accounts, some 70,000 Russian troops withdrew to the Kheronese Peninsula to the southeast of the city, hoping to find there the ships on which they could withdraw to the Caucasus. No transportation arrived, however, and on July 4th, the last Russian resistance ceased. Vice-Admiral Oktjabrskij, Commander of the Russian combined forces (land, sea and air) and Major General Petrov, Commander of the garrison, succeeded, however, in escaping.

The German High Command, in its review of the fighting at Sevastopol, states that 97,000 prisoners were captured between June 7th and July 4th. They state that the loss of their own troops was as follows:

Killed:	190 officers,	4,147 men
Missing:	11 officers,	1,580 men
Wounded:	671 officers,	17,512 men

The Roumanian High Command states that approximately 2,500

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Roumanian officers and soldiers were also killed, wounded, and missing during the Sevastopol operation.

It behooves the United States, which, in the course of this war, will certainly be confronted with the task of storming fortification lines of permanent character, to heed the German experience in this most bitterly contested of modern sieges:--SEVASTOPOL.

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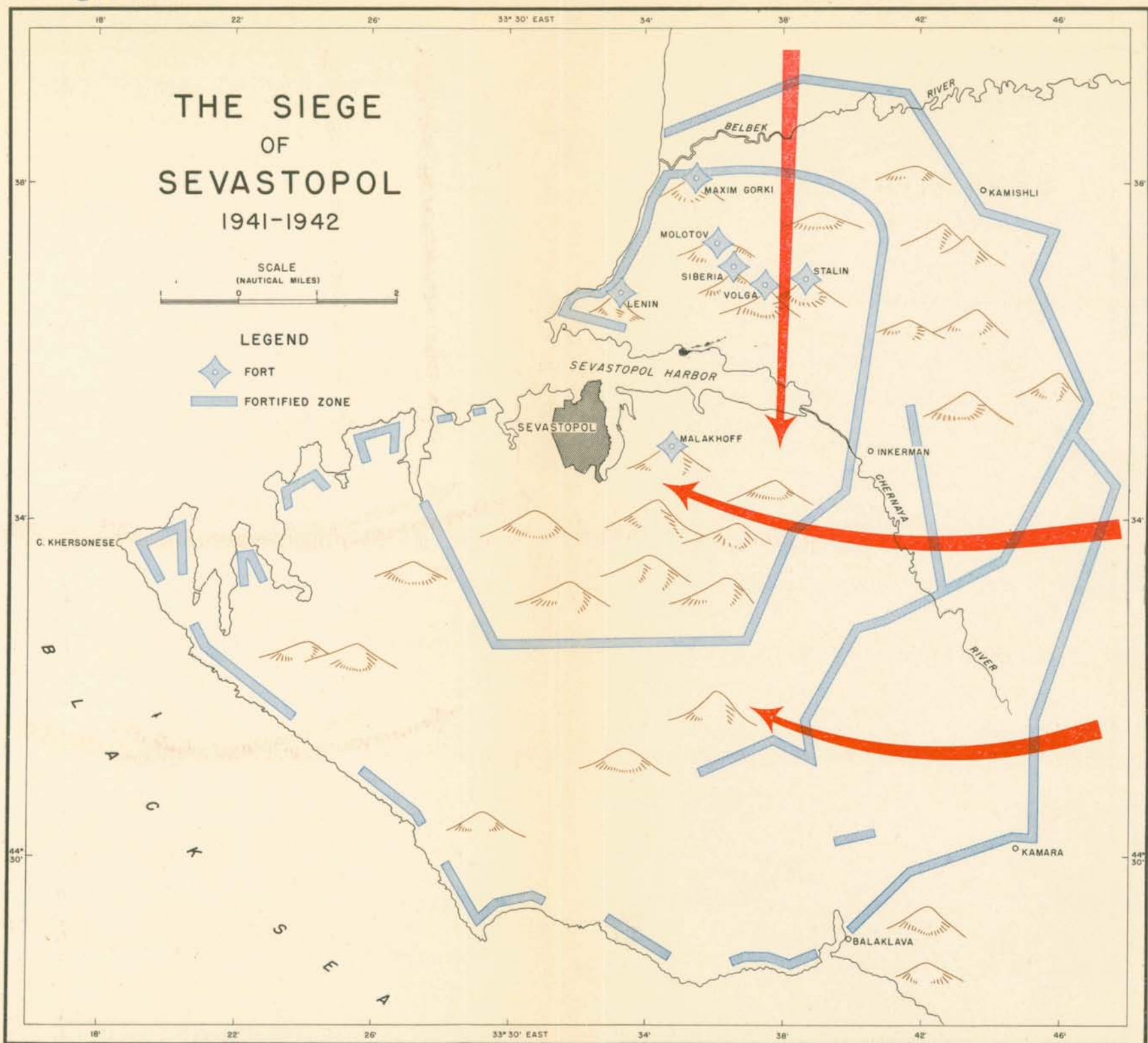
THE SIEGE OF SEVASTOPOL 1941-1942

SCALE
(NAUTICAL MILES)



LEGEND

-  FORT
-  FORTIFIED ZONE



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